United States
Department of
Agriculture

Natural
Resources
Conservation
Service

In cooperation with
Texas Agricultural
Experiment Station and
Texas State Soil and Water
Conservation Board

Soil Survey of Fayette County, Texas

How to Use This Soil Survey

General Soil Map

The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

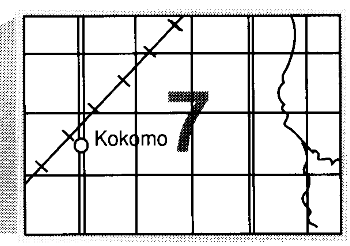
To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

Detailed Soil Maps

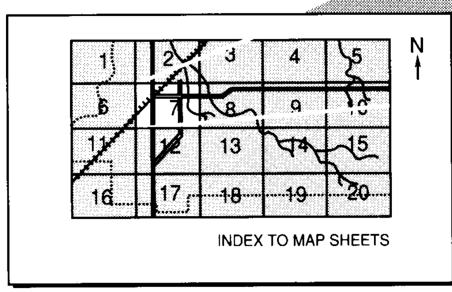
The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet and turn to that sheet.

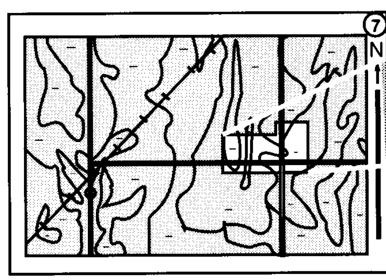
Locate your area of interest on the map sheet. Note the map units symbols that are in that area. Turn to the **Contents**, which lists the map units by symbol and name and shows the page where each map unit is described.



MAP SHEET



INDEX TO MAP SHEETS



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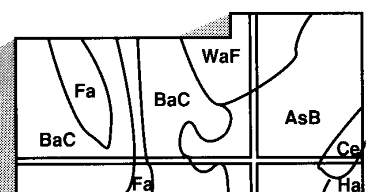

AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Contents** shows which table has data on a specific land use for each detailed soil map unit. Also see the **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1991. Soil names and descriptions were approved in 1992. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1992. This survey was made cooperatively by the Natural Resources Conservation Service, the Texas Agricultural Experiment Station, and the Texas State Soil and Water Conservation Board. The survey is part of the technical assistance furnished to the Fayette Soil and Water Conservation District.

Cover: In the springtime, fields of wildflowers provide a spectacular view in many areas of the calcareous Blackland Prairie soils in Fayette County.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service homepage on the World Wide Web. The address is http://www.nrcs.usda.gov.

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Issued 2004

Foreword

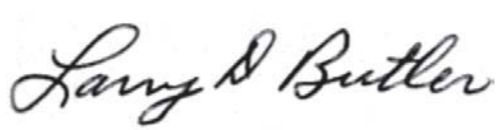
This soil survey contains information that affects land use planning in this survey area. It contains predictions of soil behavior for selected land uses. The survey also highlights soil limitations, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations that affect various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Texas Cooperative Extension Service.



Larry D. Butler
State Conservationist
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Soil Survey of Fayette County, Texas

By Dennis D. Ressel and Samuel E. Brown, Jr., Natural Resources Conservation Service

Fieldwork by Samuel E. Brown, Jr., Roy H.L. Bruns, James A. Douglass II, Dennis D. Ressel, Anita Trevino, and John D. Wagner, Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with the Texas Agricultural Experiment Station and Texas State Soil and Water Conservation Board

FAYETTE COUNTY is in the southeastern part of central Texas (fig. 1). The county has a total area of 614,100 acres, or about 960 square miles. Of that total, about 4,666 acres is water. The county is about 45 miles long and 26 miles wide. In most areas, the topography is nearly level to undulating, but some areas are hilly and steep. The elevation ranges from 200 to 500 feet above sea level.

Fayette County is in the Texas Claypan Area and Texas Blackland Prairie Major Land Resource Areas (MLRAs). The sandy and loamy soils that formed under post oak savannah in the Texas Claypan area are mostly light in color. The clayey and loamy soils that formed under grass in the Texas Blackland Prairie are mostly dark. Many creeks and streams form a part of the Colorado River watershed.

Hayland, pasture, and rangeland are the major land uses. A few areas are in woodland.

General Nature of the Survey Area

This section gives general information concerning Fayette County. It describes settlement and population, agriculture, natural resources, and climate of the county.

Settlement and Population

Fayette County was created from Bastrop and Colorado Counties in 1837. The county was named after Marquis de Lafayette, a French hero of the American Revolution. The Lipan Indian tribe originally inhabited the area east of the Colorado River, while the Tonkawa Indian tribe occupied the area west of the river. These tribes remained in the county until it was settled.

Fayette County was a part of the Stephen F. Austin colony. In 1823, the ruling Mexican government issued land grants to the first settlers, who were mainly from Tennessee and Alabama. They played a prominent role in the battles with Mexico during the Texas struggle for independence. At Monument Hill State Park, near La Grange, the county honored their contributions by interring the ashes of the men of the Nicholas Dawson Company and the Mier Expedition.

Between 1840 and 1860, while many of the original settlers were migrating westward, many Germans and Czechs immigrated into Fayette County. By 1892, a major railroad line linked La Grange to Houston and St. Louis.

The population of Fayette County in 1990 was 20,095. La Grange, the county seat, had a population of 3,951. Other towns in Fayette County include Schulenburg, Flatonia, Fayetteville, Round Top, Carmine, and Warda *(12)*.

Agriculture

Livestock, hay, poultry, and crops are the main agricultural enterprises in Fayette County. Crop production, mainly cotton and corn, was once the primary land use. Pasture and hayland have replaced cultivated crops in most areas.

Livestock operations are mainly cow-calf. Beef cattle sales accounted for about 60 percent of the agricultural income in 1990. Ranchers pasture livestock

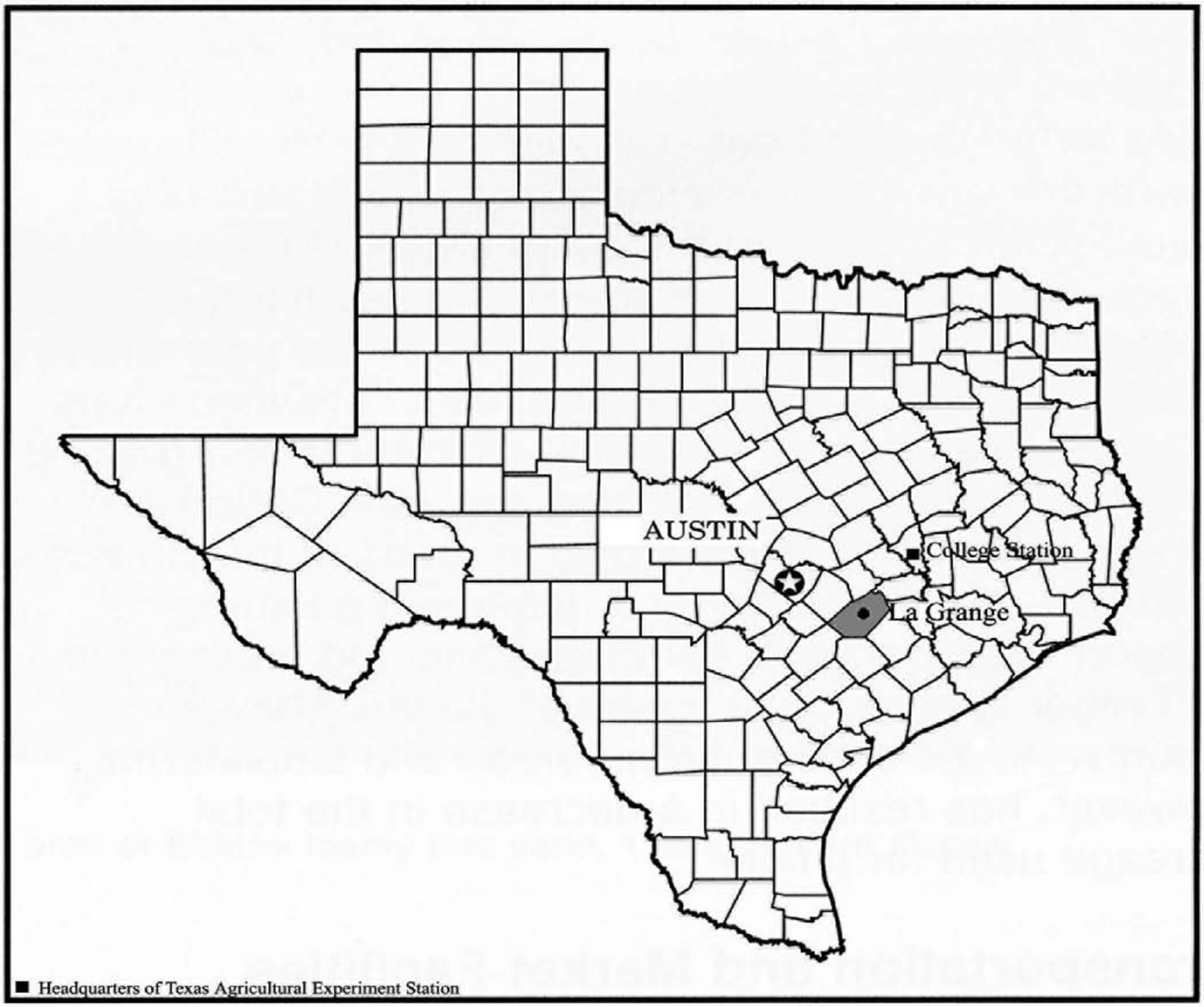

Figure 1.—Location of Fayette County in Texas.

in summer and feed hay and supplements in winter. The improved pastures and hayland within the county are planted mainly in improved bermudagrass varieties, such as coastal bermudagrass. Some areas are planted in improved bluestem grasses, such as gordo and medio, and some areas are pastures of kleingrass.

Other livestock industries include hog and dairy operations. Hog operations consist mainly of confined feeding systems and feeder pig operations. Many of these operations farrow pigs in open pastures using A-frame huts. Dairy farms are throughout the county and range in size from 30 to 250 cows per farm. The most popular breed is Holstein, but some dairies have Jersey and Brown Swiss.

Poultry farms consist mainly of confined egg-laying operations, which range in size from a few hundred to more than 250,000 birds per farm.

Crop production consists mainly of corn and grain sorghum. Cotton, wheat, peanuts, and other small grains are also grown.

Natural Resources

Soil is the most important natural resource in Fayette County. The production of livestock, hay, and crops, which are the main sources of income in the county, depend upon the soil.

Mineral resources include oil, natural gas, gravel, and stone (fig. 2). Potential sources of near surface and deep basin lignite coal are in the area.

The Colorado River, East and West Navidad Rivers, creeks, streams, Fayette Power Plant cooling lake, ponds, and watershed reservoirs provide adequate water sources in the county. The water is used for livestock, recreation, and energy-related resources. Fayette County uses very little water for irrigation, except from the Colorado River.

Fish and wildlife are important natural resources. The north-central and southwest parts of the county are the major areas used for deer hunting. Wildlife areas are mainly in rangeland. Most ponds and small lakes are used for fishing as a secondary use.

Woodland is an important natural resource. Pine timber production is limited; however, timber management practices and marketing could create a source of income for timber owners. The soils in the northwest part of the county have good potential for growing pine and hardwood trees.

Climate

Fayette County is hot in summer but cool in winter when an occasional surge of cold air causes a sharp drop in otherwise mild temperatures. Rainfall is uniformly distributed throughout the year, reaching a slight peak in spring. Snowfalls are infrequent. Annual total precipitation is normally adequate for cotton, feed grains, and small grains.

Table 1 gives data on temperature and precipitation for the survey area, as recorded at Flatonia, Texas, in the period 1951 to 1988. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 54 degrees F and the average daily minimum temperature is 43 degrees. The lowest temperature on record, which occurred on January 11, 1982, is 9 degrees. In

Figure 2.—Oil and gas production is a major industry in Fayette County. These wells are in an area of Flatonia loam, 1 to 3 percent slopes.

summer, the average temperature is 83 degrees, and the average daily maximum temperature is 94 degrees. The highest recorded temperature, which occurred on July 7, 1954, is 110 degrees.

Growing degree days, shown in table 1, are equivalent to “heat units.” During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 37 inches. Of this, 22 inches, or 60 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 15 inches. The heaviest 1-day rainfall during the period of record was 12 inches on August 31, 1981. Thunderstorms occur on about 37 days each year.

Average seasonal snowfall is less than 1 inch. The greatest snow depth at any one time during the period of record was 12 inches.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 65 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the southeast. Average wind speed is highest, 10 miles per hour, in spring.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept or model of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists.

For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

General Soil Map Units

The general soil map in this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The components of one map unit can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Each map unit is rated for cultivated crops, pasture and hay, woodland, and urban uses. Cultivated crops are those grown extensively in the survey area. Pastures and hay refer to improved, locally grown grasses and legumes. Woodland refers to areas of native or introduced trees. Urban uses include residential, commercial, and industrial developments.

The boundaries of the general soil map units in Fayette County were matched, where possible, with those of the previously completed survey areas. In a few areas, however, the lines do not join and the names of the map units differ. These differences result mainly because of changes in soil series concepts, differences in map unit design, and changes in soils patterns near survey area boundaries.

Dominantly Gently Sloping, Loamy and Clayey Soils on Prairie Uplands

This group of general soil map units makes up 30 percent of Fayette County. The Frelsburg and Carbengle soils formed in marls and sandstones of the Fleming Formation and Oakville Sandstone. The Greenvine and Flatonia soils formed in tuffaceous materials of the Catahoula, Whitsett, Manning, and Wellborn Formations. The Crockett, Normangee, and Luling soils formed in shales of the Cook Mountain Formation. Native grasses are mainly bluestem, dropseed, grama, panicum, paspalum, and switchgrass. Trees are predominantly live oak, post oak, cedar, and juniper. Mesquite and huisache have invaded some areas.

These soils are suited to crops such as corn, small grains, and grain sorghum. Improved bermudagrass, kleingrass, old world bluestem, johnsongrass, and legumes are suitable pasture plants. Fertilizing can help increase crop and grass yields. Erosion control measures are needed in cultivated areas.

The scenic, rolling countryside makes desirable homesites. The soils in this group have limitations that affect urban use. The main limitations are high shrink-swell potential, very slow permeability, and corrosivity to uncoated steel. These limitations can be partly overcome by good design and careful installation.

1. Frelsburg-Carbengle

Well drained and moderately well drained, very slowly permeable and moderately permeable soils that are moderately deep to very deep to marl or sandstone

This map unit consists of Frelsburg soils on upland divides and side slopes and Carbengle soils on ridgetops and side slopes (fig. 3).

This unit makes up about 21 percent of the survey area. It is 50 percent Frelsburg soils, 29 percent Carbengle soils, and 21 percent soils of minor extent.

Frelsburg soils are very deep, moderately well drained, and gently sloping or moderately sloping. Typically, these soils have a clay surface layer 10 inches thick that is very dark gray in the upper part and dark gray in the lower part. The subsoil is clay with calcium carbonate concretions throughout. It is gray to 70 inches and mottled light gray and light reddish brown below. The soil is moderately alkaline throughout.

Carbengle soils are moderately deep, well drained, and gently sloping or moderately sloping. Typically, these soils have a dark grayish brown sandy clay loam surface layer 10 inches thick. The subsoil extends to a depth of 33 inches. It is light yellowish brown loam in the upper part and very pale brown clay loam in the

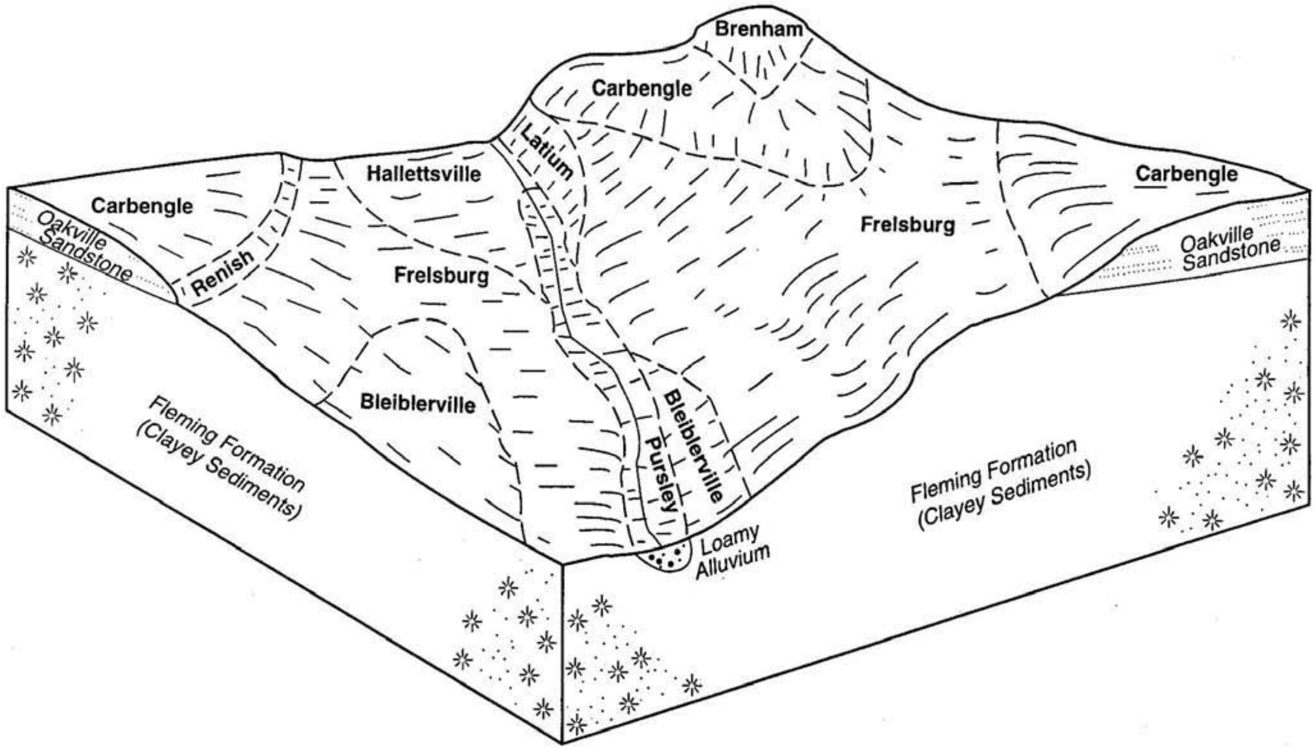

Figure 3.—Pattern of soils and underlying material in the Frelsburg-Carbengle general soil map unit.

lower part. Masses of calcium carbonate are common. The substratum, to 40 inches, is white and very pale brown weakly cemented sandstone. The soil is moderately alkaline throughout.

Soils of minor extent in this map unit are Bleiblerville, Brenham, Hallettsville, Latium, Pursley, and Renish. The clayey Bleiblerville soils are on concave uplands and along drainageways. The loamy Brenham soils are on convex hills and side slopes. The loamy Hallettsville soils are on weakly concave footslopes and are moderately well drained. The clayey Latium soils are on side slopes along streams. The loamy Pursley soils are on flood plains of small streams. The loamy Renish soils are on convex hills and moderately steep side slopes.

Cropland is the main land use of this unit. Pasture and rangeland are secondary land uses.

The main crops suited to these soils are corn, small grains, and grain sorghum. These soils have adequate drainage, but the amount of available moisture during summer months is often too low to grow crops. Fertilizers are necessary for good yields. Terraces and contour farming reduce erosion.

The main pasture grasses are kleingrass, old world bluestem, arrowleaf clover, vetch, weeping lovegrass, and improved bermudagrass. Conservation practices include fertilizing, controlling grazing, and controlling weeds.

Rangeland vegetation consists of mid and tall grasses with scattered oaks. Native grasses include bluestem, switchgrass, grama, and dropseed. Controlled grazing is important to maintain the most desirable grasses and to continue high forage production.

The soils in this unit are suited to trees such as live oak, post oak, cedar, and juniper.

Farm ponds constructed in Carbengle soils may require chemical treatment or compaction or both to protect against seepage.

The soils in this unit have potential for wildlife habitat. Deer, dove, quail, songbirds, and squirrels are found throughout the unit. Brush and trees provide cover and resting areas for deer. Clearing many areas of brush restricts wildlife habitat.

Frelsburg soils are poorly suited to most urban uses. The main limitations are shrinking and swelling with changes in moisture, low strength, high clay content,

and corrosivity to uncoated steel. These soils are poorly suited to septic tank absorption fields because of very slow permeability. Protection against cave-ins should be used when excavating these soils. These limitations can be partly overcome with good design and careful installation.

These soils are moderately suited to most recreational uses. The main limitations are very slow permeability and a clayey surface layer which causes the soils to be sticky when wet.

Carbengle soils are moderately suited to most urban uses and well suited to most recreational uses. The limitations are depth to bedrock and slope.

2. Greenvine-Flatonia

Well drained and moderately well drained, very slowly permeable and slowly permeable soils that are moderately deep and deep to tuffaceous materials

This map unit consists of Greenvine soils on interstream divides and side slopes and Flatonia soils on footslopes, low ridges, and upland stream divides.

This unit makes up about 5 percent of the survey area. It is 34 percent Greenvine soils, 29 percent Flatonia soils, and 37 percent soils of minor extent.

Greenvine soils are moderately deep, well drained, and very gently sloping and gently sloping. Typically, they have a very dark gray clay surface layer 14 inches thick. The subsoil, to a depth of 39 inches, is clay that is dark gray in the upper part and gray in the lower part. The substratum is white tuffaceous material. The soil is slightly alkaline throughout.

Flatonia soils are deep, moderately well drained, and very gently sloping. Typically, the soils have a dark gray loam surface layer 4 inches thick. The subsoil, to a depth of 33 inches, is very dark gray and dark gray clay. From 33 to 55 inches, it is light brownish gray silty clay and light gray clay loam. The substratum to 80 inches is white, weakly cemented tuffaceous siltstone. These soils are slightly acid in the upper part and slightly alkaline in the lower part.

Soils of minor extent in this map unit are Arol, Frelsburg, Hallettsville, Renish, Shalba, and Singleton. The loamy Arol soils are on slightly lower nearly level areas. The clayey Frelsburg soils are on upland divides and side slopes. The loamy Hallettsville soils are on footslopes and upland stream divides. The loamy Renish soils are on side slopes. The loamy Shalba soils are on upland ridges and are moderately well drained. The loamy Singleton soils are on interstream divides and side slopes.

Pasture and rangeland are the major land uses of this unit. A few areas are used for cropland.

The main pasture grasses are improved bermudagrass, gordo bluestem, old world bluestem, switchgrass, kleingrass, sweetclover, and vetch. Conservation practices include fertilization, weed control, and controlled grazing.

Rangeland vegetation includes bluestem, panicum, and paspalum with scattered live oak and post oak trees. Mesquite and brush have invaded where grazing is continuous and close. Conservation practices such as brush control and controlled grazing help maintain grass vigor.

These soils are suited to grain sorghum, forage sorghum, corn, and small grain crops. These soils form wide cracks when dry and are difficult to work during extremes in moisture content. Planting crops that produce a large amount of residue and leaving the residue on or near the surface help control erosion and maintain tilth. Deep rooted legumes help aerate the soil and improve fertility. Conservation practices include controlling erosion and maintaining soil tilth. These soils have high natural fertility and high organic matter content.

These soils have potential for wildlife habitat. Deer, dove, quail, furbearers, and songbirds inhabit this area. Several grasses and forbs provide food and cover for game birds and animals. A good selection of forbs for deer is available and in some areas tall grasses provide turkey nesting sites.

Greenvine soils are poorly suited to most urban uses. Shrinking and swelling with changes in moisture, very slow permeability, depth to bedrock, clayey subsoil, low strength, and corrosivity to uncoated steel are the main limitations. Protection against cave-ins should be used when excavating these soils. These limitations can be partly overcome by using good design and careful installation.

These soils are moderately suited to most recreational uses. The main limitations are very slow permeability and the clay surface texture. These soils form deep, wide cracks when dry and are sticky when wet.

The Flatonia soils are poorly suited to most urban uses. The main limitations are shrinking and swelling with changes in moisture, slow permeability, corrosivity to uncoated steel, depth to bedrock, and low strength. Protection against cave-ins should be used when excavating these soils. These limitations can be partly overcome by good design and careful installation.

These soils are well suited to most recreational uses.

3. Crockett-Normangee-Luling

Well drained and moderately well drained, very slowly permeable soils that are deep to weathered shale

This map unit consists of Crockett soils on broad upland ridges and side slopes and Normangee and Luling soils on uplands.

This unit makes up about 3 percent of the survey area. It is 40 percent Crockett and similar soil, 21 percent Normangee soils, 11 percent Luling soils, and 28 percent soils of minor extent.

Crockett soils are moderately well drained and very gently sloping. Typically, they have a brown loam surface layer 9 inches thick. The subsoil is brown and light olive brown clay to a depth of 29 inches, and brownish yellow clay loam, to a depth of 47 inches. The substratum, to 62 inches, is stratified shale in shades of brown, yellow, and gray. They are slightly acid in the upper part and moderately alkaline in the lower part.

Normangee soils are moderately well drained and gently sloping. Typically, they have a dark grayish brown clay loam surface layer 7 inches thick. The subsoil, to a depth of 50 inches, is clay that is brown and dark grayish brown in the upper part, and light olive brown in the lower part. The substratum, to 65 inches, is stratified shale with clay texture in shades of brown, yellow, and gray. They are slightly acid in the upper part and moderately alkaline in the lower part.

Luling soils are well drained. Typically, Luling soils have a dark grayish brown to very dark grayish brown clay surface layer and subsurface layer 16 inches thick. The subsoil, to a depth of 53 inches, is clay that is dark grayish brown in the upper part, and light olive gray in the lower part. The substratum, to 72 inches, is light gray shale. They are slightly alkaline in the upper part and moderately alkaline in the lower part.

Soils of minor extent in this map unit are Denhawken, Elmendorf, Inez, and Kurten. The loamy Denhawken and Elmendorf soils are on uplands. The loamy Inez soils are on nearly level low stream terraces. The loamy Kurten soils are on convex ridges and side slopes of ridges.

Rangeland is the major land use of this unit. Some small areas are used for pasture and cropland.

Rangeland vegetation consists of mid and tall grasses with a few trees. In many areas, invaders like mesquite and huisache are the main type of vegetation with poor quality forbs as an understory. Conservation practices include brush control and controlled grazing with adequate rest periods.

The main pasture grasses are improved bermudagrass, kleingrass, old world bluestem, johnsongrass, arrowleaf clover, singletary peas, and vetch. Conservation practices include using a complete fertilizer, weed and brush control, and controlled grazing.

Crops grown on this map unit are small grain crops and forage and grain sorghums. These soils have low natural fertility. They easily form a surface crust. Conservation practices include controlling erosion and runoff, improving soil fertility, and varying the depth of tillage to avoid forming a plowpan.

The soils in this unit have potential for wildlife habitat. Dove, deer, turkey, rabbit, and quail are common. Tall grasses provide good cover and food for deer and turkey. Thick stands of brush provide good cover and resting areas.

Crockett soils are poorly suited to urban uses. The main limitations are shrinking and swelling with changes in moisture, very slow permeability that affects septic tank absorption fields, and low strength of the clayey subsoil which affects streets and roads. These limitations can be partly overcome by good design and careful installation.

These soils are moderately suited to most recreational uses. The main limitation is very slow permeability.

Normangee soils are poorly suited to most urban uses. Shrinking and swelling with changes in moisture, corrosivity to uncoated steel, and very slow permeability that affects septic tank absorption fields are the main limitations. These limitations can be partly overcome by good design and careful installation.

These soils are moderately suited to most recreational uses. The main limitation is very slow permeability.

Luling soils are poorly suited to most urban uses. Shrinking and swelling with changes in moisture, corrosivity to uncoated steel, and very slow permeability are the main limitations. Protection against cave-ins should be used when excavating these soils. These limitations can be partly overcome with good design and careful installation.

These soils are moderately suited to most recreational uses. The main limitations are very slow permeability, clayey surface texture, and small stones on the soil surface.

Dominantly Nearly Level to Gently Sloping, Sandy and Loamy Soils on Upland Savannahs

This group of general soil map units makes up 53 percent of Fayette County. The Dubina, Hallettsville, and Straber soils formed in sandy, loamy, and clayey materials of the Fleming Formation. The Arol, Rutersville, and Singleton soils formed in tuffaceous materials of the Catahoula, Whitsett, Manning, and Wellborn Formations. The Chazos, Gredge, and Zack soils formed in loamy materials of the Yegua Formation. The Burlewash and Cadell soils formed in shale and tuffaceous materials of the Caddell, Catahoula, Whitsett, Manning, and Wellborn Formations. The Carmine, Rek, and Straber soils formed in loamy and clayey materials and beds of

siliceous gravel of the Willis Formation and Pleistocene high gravel deposits and alkaline loamy and clayey materials. The Padina soils formed in sandy materials of the Sparta Formation. Native grasses are bluestem, grama, paspalum, panicum, and threeawn. Trees consist mainly of post oak, live oak, blackjack oak, cedar, juniper, elm, and hackberry.

Most of these soils have clayey subsoils that restrict the movement of water and growth of roots. Suitable crops are small grain crops, corn, and forage and grain sorghums. The sandy soils are suited to peanuts, melons, grapes, and truck crops. Suited pasture plants are improved bermudagrass, kleingrass, weeping lovegrass, bahiagrass, and legumes. Fertilizers increase crop and grass yields. Erosion control measures are needed in cultivated areas.

The crests of steeper slopes are scenic and make desirable homesites. The soils in this group have limitations that affect urban use. The main limitations are high shrink-swell potential, very slow permeability, and corrosivity to uncoated steel. These limitations can be partly overcome by good design and careful installation.

4. Hallettsville-Straber-Dubina

Moderately well drained, very slowly permeable and slowly permeable soils that are very deep to sandy, loamy, and clayey materials

This map unit consists of Hallettsville soils on footslopes and upland stream divides, Straber soils on broad convex upland stream divides, and Dubina soils on upland stream divides and side slopes (fig. 4).

This unit makes up about 18 percent of the survey area. It is 31 percent Hallettsville soils, 30 percent Straber soils, 10 percent Dubina soils, and 29 percent soils of minor extent.

Hallettsville soils are very slowly permeable and very gently sloping. Typically, these soils have a dark grayish brown fine sandy loam surface layer 8 inches thick. The subsoil, from 8 to 20 inches, is very dark gray sandy clay, and from 20 to 41 inches, it is grayish brown clay and clay loam. The lower part, from 41 to 62 inches, is pale brown clay loam and light yellowish brown sandy clay loam. The substratum, to a depth of 80 inches, is pale brown and light gray clay loam stratified with thin layers of shale. Reaction ranges from moderately acid in the upper part of this soil to moderately alkaline in the lower part.

Straber soils are very slowly permeable and gently sloping to moderately sloping. Typically, these soils have pale brown and very pale brown loamy fine sand surface and subsurface layers 14 inches thick. The subsoil, to a depth of 65 inches, is sandy clay, sandy clay loam, and clay loam that is brownish yellow and light gray with mottles in shades of red, brown, gray, and yellow. The substratum, to a depth of 80 inches, is pale yellow clay loam. Reaction ranges from strongly acid in the upper part of this soil to moderately alkaline in the lower part.

Dubina soils are slowly permeable and gently sloping. Typically, these soils have a dark brown loamy fine sand surface layer 16 inches thick. The upper part of the subsoil, from 16 to 54 inches, is sandy clay that is brown to a depth of 27 inches and mottled in shades of yellow, red, and gray to a depth of 54 inches. The middle part of the subsoil, from 54 to 70 inches, is strong brown sandy clay loam that is mottled reddish yellow and light yellowish brown. The lower part of the subsoil, to a depth of 80 inches, is brownish yellow fine sandy loam. Reaction ranges from slightly acid in the upper part of this soil to moderately alkaline in the lower part.

Soils of minor extent in this map unit are Brenham, Carbengle, Frelsburg, Greenvine, Knolle, Koether, Latium, Lufkin, Pursley, Schulenburg, and Tremona.

The loamy Brenham and Schulenburg soils are on side slopes. The loamy Carbengle soils are on ridges and side slopes. The clayey Frelsburg and Greenvine soils are on upland divides and side slopes. The sandy Koether and Knolle soils are on convex ridgetops and side slopes. The clayey Latium soils are on slope breaks of uplands. The loamy Lufkin soils are on nearly level uplands and are moderately well drained. The loamy Pursley soils are on flood plains of small streams. The loamy Schulenburg soils are on side slopes, and the sandy Tremona soils are on stream divides and side slopes.

Pasture is the major land use. Other areas are used for rangeland and cropland.

The main pasture grasses are improved bermudagrass, bahiagrass, kleingrass, weeping lovegrass, old world bluestem, arrowleaf clover, and vetch. Conservation practices include using a complete fertilizer and controlling weeds and grazing.

Rangeland vegetation consists of mid and tall grasses with an overstory of oak. Grasses such as bluestem, paspalum, panicum, and grama are common. Conservation practices include brush control and deferred grazing.

Crops grown on this map unit are small grain crops, forage and grain sorghums, and corn. Certain truck crops such as peanuts, melons, and grapes are also grown. Conservation practices include using a complete fertilizer, controlling runoff, conserving

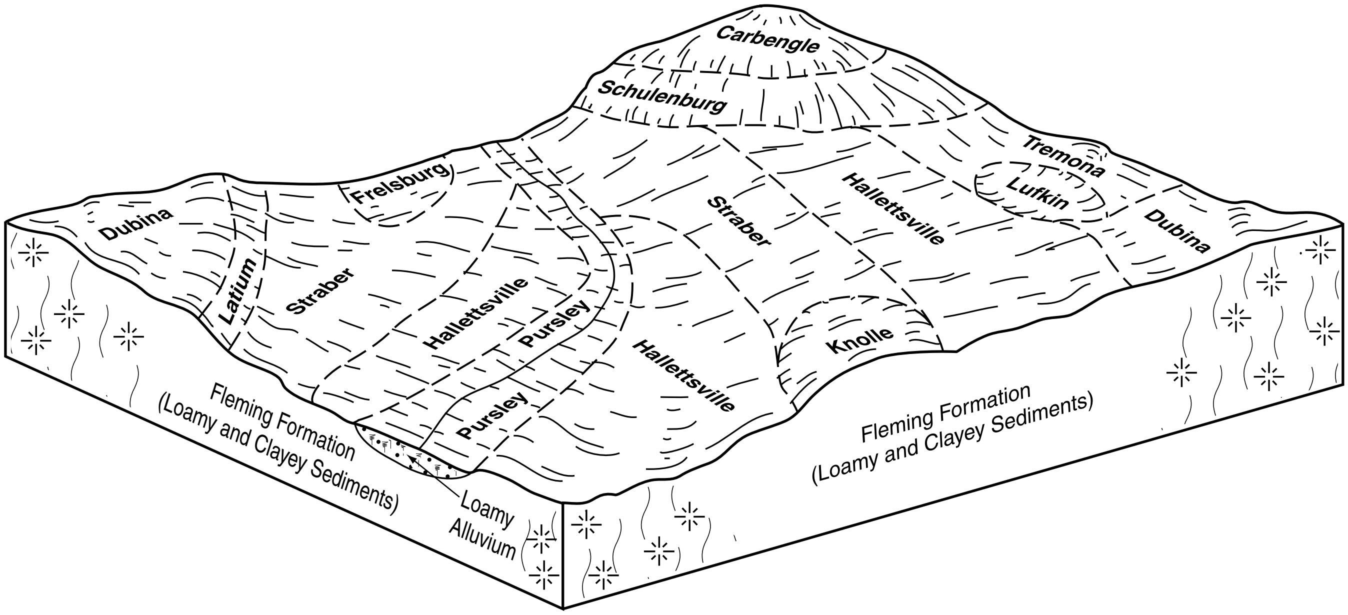

Figure 4.—Pattern of soils and underlying material in Hallettsville-Straber-Dubina general soil map unit.

moisture, and controlling wind erosion on soils that have a sandy surface.

The soils in this map unit are suited to trees such as post oak, live oak, elm, and hackberry.

The soils in this unit have potential for wildlife habitat. Deer, dove, quail, squirrels, rabbits, and songbirds are common. The amount and type of food are varied. Motts of trees and dense stands of brush provide cover and resting areas for wildlife.

Hallettsville soils are poorly suited to most urban uses. The main limitations are very slow permeability, shrinking and swelling with changes in moisture, clayey subsoils, and corrosivity to uncoated steel. These limitations can be partly overcome by good design and careful installation.

This soil is moderately suited to most recreational uses. The main limitation is very slow permeability.

Straber soils are poorly suited to most urban uses. Limitations include shrinking and swelling with changes in moisture, very slow permeability, seepage, low strength, and corrosivity to uncoated steel and concrete. These limitations can be partly overcome by good design and careful installation.

These soils are moderately suited to most recreational uses. The limitations are very slow permeability and slope.

Dubina soils are moderately suited to most urban uses. The main limitations are shrinking and swelling of the subsoil with changes in soil moisture, slow permeability, seepage, clayey subsoil, and corrosivity to uncoated steel. These limitations can be partly overcome by good design and careful installation. To protect against water erosion and soil blowing, the soil needs a thick protective vegetative cover.

These soils are well suited to most recreational uses.

5. Singleton-Arol-Rutersville

Moderately well drained, very slowly permeable and slowly permeable soils that are moderately deep and deep to tuffaceous materials

This map unit consists of Singleton soils on interstream divides and side slopes; Arol soils on upland ridge divides, saddles, and along drainageways; and Rutersville soils on interstream divides and concave footslopes (fig. 5).

This unit makes up about 14 percent of the survey area. It is 32 percent Singleton soils, 17 percent Arol soils, 16 percent Rutersville and similar soils, and 35 percent soils of minor extent.

Singleton soils are moderately deep, very gently sloping, and moderately well drained. Typically, these soils have a light brownish gray and light gray fine sandy loam surface layer and subsurface layer 7 inches thick. The subsoil, to a depth of 33 inches, is dark brown clay in the upper part and light brownish gray and white sandy clay loam in the lower part. Mottles in shades of gray, yellow, and brown are common in the lower part. The substratum, to a depth of 55 inches, is white weakly to strongly cemented

tuffaceous sandstone. This soil is very strongly acid to slightly acid in the upper part, and neutral and slightly alkaline in the lower part.

Arol soils are moderately deep, nearly level, and moderately well drained. Typically, these soils have a light brownish gray fine sandy loam surface layer 5 inches thick. The subsoil, to a depth of 37 inches, is very dark gray and dark gray clay. The substratum, to a depth of 54 inches, is light brownish gray and light gray tuff. Reaction ranges from moderately acid in the upper part of the soil to neutral in the lower part.

Rutersville soils are deep, nearly level and very gently sloping, and moderately well drained. Typically, the Rutersville soils have a grayish brown and white loamy fine sand surface layer and subsurface layer 14 inches thick. The subsoil, to a depth of 34 inches, is light brownish gray clay loam in the upper part and light brownish gray sandy clay loam in the lower part. The lower part of the subsoil, from 34 to 54 inches, is light brownish gray and light gray fine sandy loam. Mottles in shades of brown and yellow are common. The substratum, to a depth of 79 inches, is stratified sandstone in shades of red, yellow, and gray. Reaction ranges from neutral to very strongly acid in the upper part of the soil to slightly acid in the lower part.

Soils of minor extent in this map unit are Burlewash, Greenvine, Koether, Lufkin, Pursley, Rehburg, Shalba, Shiro, Uhland, and Winedale. The loamy and well drained Burlewash soils are on interstream divides, ridges, side slopes, and footslopes. The clayey and well drained Greenvine soils are on convex uplands. The loamy and somewhat excessively drained Koether soils are on ridgetops and side slopes of convex uplands. The loamy Lufkin soils are on nearly level uplands. The loamy Pursley soils are on flood plains of small streams. The sandy Rehburg soils are on uplands and stream terraces. The loamy Shalba soils are on ridgetops and are moderately well drained. The sandy Shiro soils are on ridgetops and side slopes and are moderately well drained. The loamy Uhland soils are on flood plains of small streams and are moderately well drained. The loamy and moderately well drained Winedale soils are on gently sloping uplands.

Pasture is the main land use. Other areas are used for rangeland and a few small areas are used for cropland.

The main pasture grasses are improved bermudagrass, kleingrass, arrowleaf clover, singletary peas, and bahiagrass. Application of a complete fertilizer, controlled grazing, and brush and weed control are necessary for good yields. Some areas may need lime because of acidic soil conditions.

Rangeland vegetation consists of mid and tall grasses with a canopy of oak. Native grasses such as bluestem, paspalum, and panicum are present if grazing has been controlled. Conservation practices include brush control and controlled grazing.

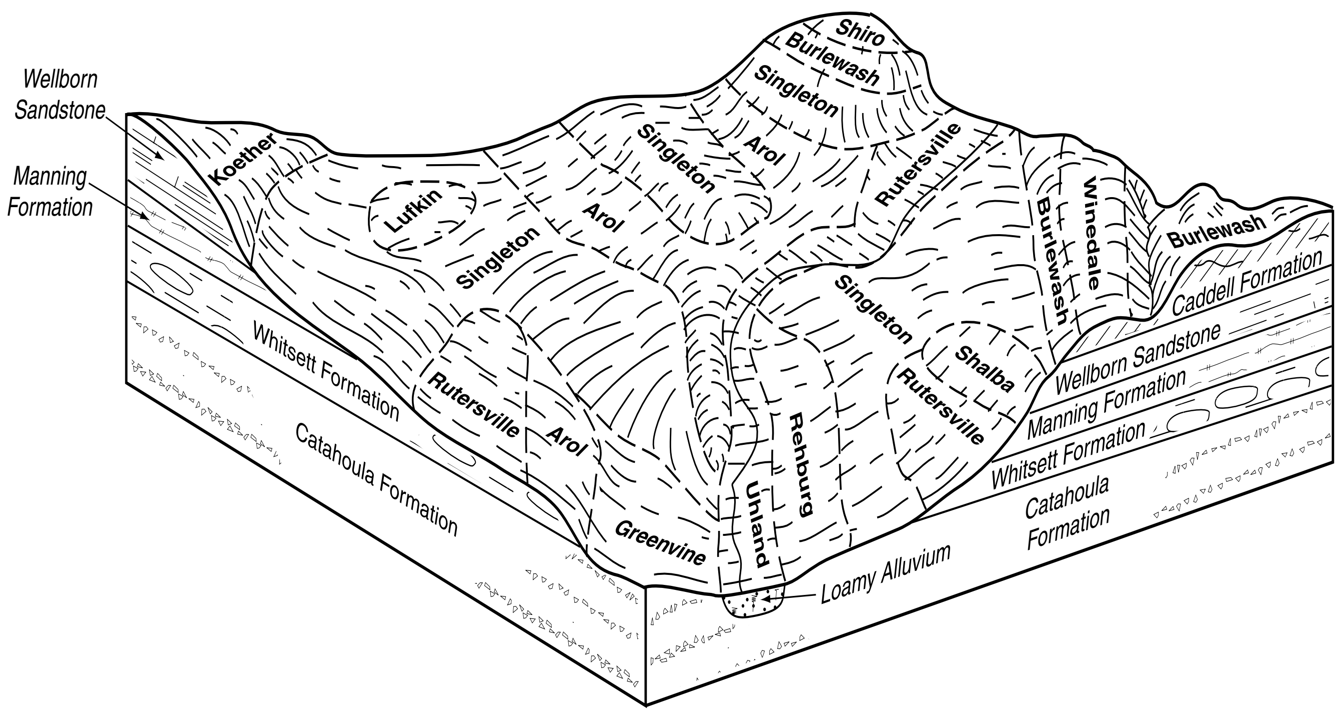

Figure 5.—Pattern of soils and underlying material in the Singleton-Arol-Rutersville general soil map unit.

Crops grown on this map unit are small grain crops, forage sorghum, and peanuts. A perched water table near the surface of some soils following extensive periods of rain will delay planting in the spring and harvesting in the fall. Conservation practices include maintaining a good supply of plant nutrients and keeping favorable soil structure. Tillage should be timely and at various depths to prevent a dense compact layer, or plowpan, from forming.

The soils in this unit are suited to trees such as post oak, blackjack oak, cedar, and juniper. Some areas have been planted to pine.

Farm ponds provide water for livestock in areas that do not have flowing water. Areas that are underlain by bedrock may require chemical treatment or compaction to seal the bottoms and occasionally the sides of ponds.

The soils in this unit have potential for wildlife habitat. The amount and type of food are varied for deer, turkey, dove, quail, squirrels, and songbirds. Areas where brush is dense provide good cover and nesting sites. Cleared areas allow native vegetation to grow for wildlife food and cover.

Singleton soils are poorly suited to most urban uses. The main limitations are shrinking and swelling with changes in moisture, very slow permeability, corrosivity to uncoated steel and concrete, and depth to bedrock. These limitations can be partly overcome by proper design and careful installation.

These soils are moderately suited to recreational uses. The main limitation is very slow permeability.

Arol soils are poorly suited to most urban uses. The main limitations are very slow permeability, clayey subsoil, low strength, high shrinking and swelling with changes in moisture, and depth to bedrock. These limitations can be partly overcome by good design and careful installation.

These soils are moderately suited to most recreational uses. The main limitations are wetness, very slow permeability, and depth to bedrock.

Rutersville soils are poorly suited to most urban uses. Seasonal wetness, shrinking and swelling with changes in moisture, slow permeability, and corrosivity to uncoated steel and concrete are limitations.

These soils are well suited to most recreational uses.

6. Gredge-Chazos-Zack

Moderately well drained, very slowly permeable and slowly permeable soils that are moderately deep to very deep loamy materials

This map unit consists of Gredge soils on upland divides and side slopes, Chazos soils on upland stream divides and side slopes, and Zack soils on convex uplands (fig. 6).

This unit makes up about 12 percent of the survey area. It is about 32 percent Gredge soils, 20 percent Chazos soils, 19 percent Zack and similar soils, and 29 percent soils of minor extent.

Gredge soils are very deep, very gently sloping, and moderately well drained. Typically, these soils have a pale brown fine sandy loam surface layer 6 inches thick. The subsoil extends to a depth of 80 inches. It is sandy clay that is dark red and reddish brown with grayish and brownish mottles in the upper part; sandy clay loam in shades of brown, gray, and yellow in the middle part; and brownish and yellowish fine sandy loam in the lower part. Reaction ranges from strongly acid in the upper part of the soil to slightly alkaline in the lower part.

Chazos soils are very deep, very gently sloping, and moderately well drained. Typically, the Chazos soils have a light yellowish brown and very pale brown loamy fine sand surface layer and subsurface layer 13 inches thick. The subsoil extends to a depth of 74 inches. To a depth of 31 inches, it is brownish yellow and reddish brown clay. Mottles of gray, red, yellow, and brown are common. From 31 to 60 inches, it is light brownish gray and light yellowish brown sandy clay loam. Mottles of gray, red, yellow, and brown are common. The lower part of the subsoil is stratified fine sandy loam and weakly cemented sandstone that is very pale brown, yellow, and light yellowish brown. Reaction ranges from slightly acid in the upper part of the soil to moderately alkaline in the lower part.

Zack soils are moderately deep, very gently sloping and gently sloping, and moderately well drained. Typically, these soils have a grayish brown very fine sandy loam surface layer 6 inches thick. The subsoil, to a depth of 14 inches, is brown clay. From 14 to 34 inches, it is reddish brown and yellowish brown clay. The lower part of the subsoil, from 34 to 38 inches, is mottled very pale brown and brownish yellow sandy clay loam. The substratum, to a depth of 72 inches, is light gray loam that has yellowish and brownish mottles. Reaction is slightly acid in the upper part of the soil and neutral in the lower part.

Soils of minor extent in this map unit are Edge, Inez, Lufkin, Robco, Uhland, and Zulch. The loamy Edge soils are on narrow divides. The loamy Inez soils are on nearly level low stream terraces. The loamy Lufkin and Zulch soils are on nearly level areas. The sandy Robco soils occur on ridges, side slopes, and on low stream terraces. The loamy Uhland soils are on flood plains of small streams.

Rangeland is the major land use. Other areas are used for pasture and a few areas are cultivated.

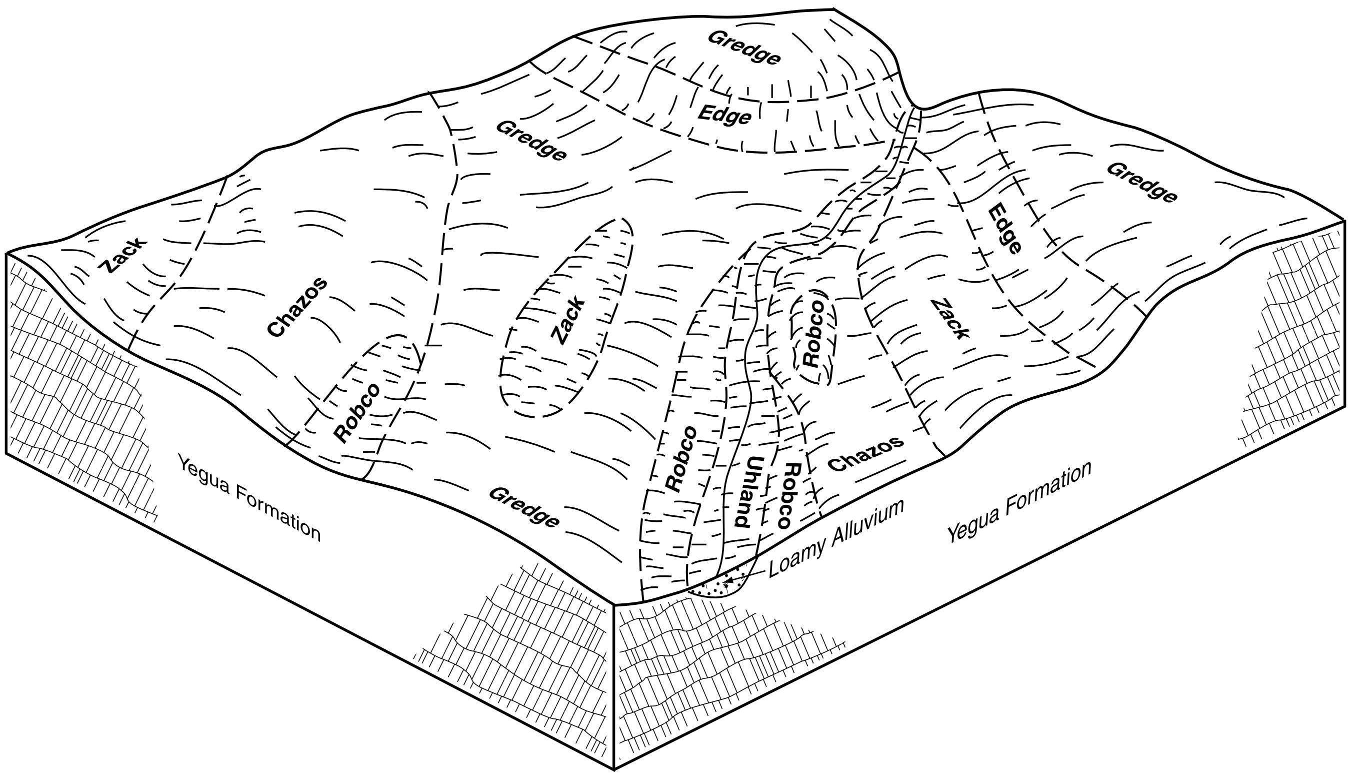

Figure 6.—Pattern of soils and underlying material in the Gredge-Chazos-Zack general soil map unit.

Rangeland vegetation consists of mid and tall grasses with an overstory of oak. Grasses such as bluestem, paspalum, panicum, and grama are common in native areas. Brush control and deferred grazing are conservation practices.

The main pasture grasses are improved bermudagrass, kleingrass, weeping lovegrass, arrowleaf clover, and vetch. Conservation practices are fertilization, weed control, and controlled grazing. Lime is needed in some areas.

Crops grown on this unit are small grain crops and forage and grain sorghums. Row crops are not normally planted because of droughtiness, moderate available water capacity, and the dense clayey subsoil. Conservation practices include controlling runoff and erosion and using a complete fertilizer.

The soils in this unit are suited to trees such as post oak, blackjack oak, cedar, and juniper. Some areas have been planted to pine, but additional fertilizer and irrigation are needed for better growth.

Farm ponds provide water for livestock in areas that do not have flowing water. Areas that are underlain by the stratified layers of sandy, loamy, and clayey materials may require a chemical treatment or compaction to seal the bottoms and occasionally the sides of ponds. Many of the soils in this unit have seepage problems in the substratum.

The soils of this unit have potential for wildlife habitat. Dove, quail, songbirds, and turkey are common. Areas of thick brush and trees provide good cover and nesting sites. Areas that have been cleared allow native vegetation for food and cover.

Gredge soils are moderately suited to most urban uses. Low strength, shrinking and swelling with changes in moisture, and very slow permeability are the main limitations. These soils are unsuited to septic tank absorption fields because of very slow permeability, clayey subsoils, and slope. These limitations can be partly overcome by good design and careful installation.

These soils are moderately suited to most recreational uses. The main limitation is very slow permeability.

Chazos soils are moderately suited to most urban uses. The main limitations are low strength, shrink-swell potential, slow permeability, clayey subsoil, and corrosivity to uncoated steel and concrete. These limitations can be partly overcome by good design and careful installation.

These soils are well suited to most recreational uses.

Zack soils are moderately suited to most urban uses. The main limitations are shrinking and swelling with changes in moisture and corrosivity to uncoated steel. These soils are unsuited to septic tank absorption fields because of the very slow permeability. These limitations can be partly overcome by good design and careful installation.

These soils are moderately suited to most recreational uses. The main limitations are very slow permeability and slope.

7. Cadell-Burlewash

Well drained and moderately well drained, very slowly permeable soils that are moderately deep and deep to shale and tuffaceous materials

This map unit consists of Cadell soils on stream divides and side slopes and Burlewash soils on interstream divides, side slopes, and footslopes.

This unit makes up about 4 percent of the survey area. It is 42 percent Cadell soils, 14 percent Burlewash soils, and 44 percent soils of minor extent.

Cadell soils are deep, very gently sloping, and moderately well drained. Typically, these soils have a light brownish gray very fine sandy loam surface layer 5 inches thick. The subsoil extends to a depth of 43 inches. It is clay loam to a depth of 24 inches that is brown with reddish brown mottles in the upper part, and grayish brown with yellowish brown mottles in the lower part. It is pale brown and pale yellow clay from 24 to 43 inches. Concretions of calcium carbonate and clusters of gypsum crystals are present. The substratum, to a depth of 80 inches, is pale olive and light gray tuffaceous clay that contains clusters of gypsum crystals. Reaction ranges from slightly acid and neutral in the upper part of the soil to slightly alkaline and moderately alkaline in the lower part. Salts are present in the lower part.

Burlewash soils are moderately deep, gently sloping, and well drained. Typically, these soils have a brown fine sandy loam surface layer 4 inches thick. The subsoil, to a depth of 19 inches, is clay that is reddish brown and brown with red mottles. From 19 to 26 inches, the subsoil is light brown clay loam with red mottles. The substratum, to 40 inches, is very pale brown and brown weakly cemented tuffaceous sandstone. These soils are very strongly acid.

Soils of minor extent in this map unit are Gredge, Greenvine, Lufkin, Rutersville, and Uhland. The loamy Gredge soils are on upland divides and side slopes. The clayey Greenvine soils are on interstream divides and side slopes. The loamy Lufkin soils are on nearly level uplands. The sandy Rutersville soils are on interstream divides and concave footslopes. The loamy Uhland soils are on flood plains of small streams.

Rangeland is the major land use. Other areas are used for pasture and a few small areas are used for cropland.

Most of the land use is restricted to rangeland because of high salt content, heavy clays, and droughtiness of the soils. Climax vegetation consists of a savannah with mid and tall grasses and an overstory of oak. Conservation practices are controlled grazing, brush control, reseeding with adapted species, and planned rest periods. In many areas, close grazing and trampling have reduced the capacity of these soils to absorb water.

The main pasture grasses are improved bermudagrass, weeping lovegrass, kleingrass, and legumes. The soils in this unit are droughty, and they need liming for acidic conditions. Conservation practices include weed control, fertilization, and planned grazing to maintain adequate stubble height.

Crops grown on this unit are small grain crops and forage sorghum. Peanuts are grown on the sandier soils. Management practices include fertilizing, liming, and maintaining a favorable soil structure.

Trees such as post oak and blackjack oak are common. However, in some areas, invaders like mesquite, huisache, and cedar have grown into dense stands.

Farm ponds provide water for livestock in areas that do not have flowing water. Areas underlain by bedrock may require chemical treatment or compaction to seal the bottom of ponds.

The soils in this unit have potential for wildlife habitat. Deer, dove, quail, and turkey are common. The native areas provide a good supply of food and the tall grasses provide nesting for turkey. Brush controlled in patterns increases the food supply for wildlife.

Cadell soils are poorly suited to most urban uses. The main limitations are shrinking and swelling of the subsoil with changes in moisture, wetness, low strength, very slow permeability, clayey subsoil, and corrosivity to uncoated steel. These limitations can be partly overcome by good design and careful installation.

These soils are moderately suited to recreational uses. The main limitation is wetness.

Burlewash soils are poorly suited to most urban uses. The shrinking and swelling of the subsoil with changes in moisture, the low strength that affects streets and roads, high clay content in the subsoil, depth to rock, and corrosivity to uncoated steel and concrete are the main limitations. The very slow permeability of the subsoil is a limitation to septic tank

absorption fields. These limitations can be partly overcome by good design and careful installation.

These soils are moderately suited to most recreational uses. The very slow permeability and depth to bedrock are limitations.

8. Straber-Rek-Carmine

Moderately well drained, very slowly permeable and slowly permeable soils that are very deep to loamy, clayey, or gravelly materials

This map unit consists of Straber soils on broad convex upland stream divides and side slopes, Rek soils on upland ridges and side slopes that have been surface-mined for gravel and cobbles, and Carmine soils on stream divides and side slopes (fig. 7).

This unit makes up about 4 percent of the survey area. It is 52 percent Straber soils, 18 percent Rek soils, 17 percent Carmine soils, and 13 percent soils of minor extent.

Typically, the Straber soils have a pale brown and very pale brown gravelly loamy fine sand surface layer and subsurface layer 12 inches thick. The subsoil, from 12 to 49 inches, is yellowish brown, light grayish brown, and light gray clay. From 49 to 72 inches, the subsoil is light gray sandy clay loam. The subsoil is mottled in shades of red, yellow, brown, and gray. Reaction in the soil ranges from very strongly acid to slightly acid.

Typically, the Rek soils have a pink extremely gravelly coarse sandy loam surface layer 3 inches thick. The upper part of the subsoil, from 3 to 7 inches, is red gravelly clay. From 7 to 22 inches, it is light gray clay. From 22 to 37 inches, it is light brownish gray sandy clay. The lower part, from 37 to 63 inches, is light gray sandy clay loam. The substratum, to 80 inches, is grayish brown weakly cemented sandstone. Reaction is very strongly acid or extremely acid.

Typically, the Carmine soils have an extremely gravelly very fine sandy loam surface layer that is light yellowish brown from 0 to 7 inches and pink from 7 to 14 inches. The subsurface layer, from 14 to 36 inches, is pink extremely gravelly loamy coarse sand. The subsoil, from 36 to 65 inches, is light gray very

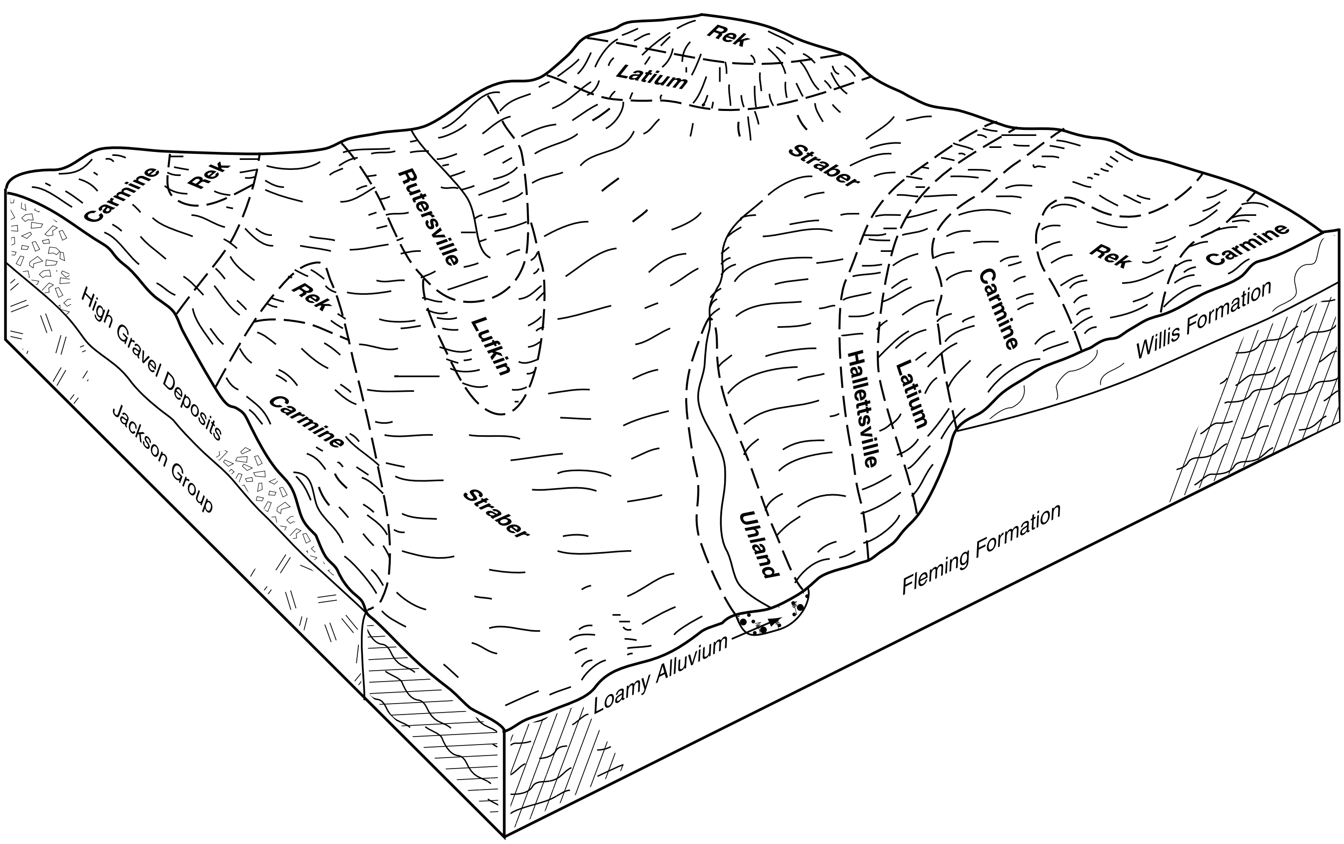

Figure 7.—Pattern of soils and underlying material in the Straber-Rek-Carmine general soil map unit.

gravelly sandy clay loam. From 65 to 80 inches, is white sandy clay loam. Reaction is slightly acid to extremely acid.

Soils of minor extent in this map unit are Hallettsville, Joiner, Latium, Lufkin, Rutersville, and Uhland. The loamy Hallettsville soils are on footslopes and upland stream divides. The sandy Joiner soils are on upland stream divides, low ridges, and side slopes. The clayey Latium soils are on slope breaks on uplands and are well drained. The loamy Lufkin soils are on nearly level uplands and are moderately well drained. The sandy Rutersville soils are on interstream divides and concave footslopes and are moderately well drained. The loamy Uhland soils are on nearly level flood plains.

Rangeland is the major land use. Other areas are used for pasture and some areas have been mined for gravel.

Rangeland vegetation consists mostly of oak trees, with scattered areas of mid and tall grasses, such as bluestem, paspalum, and threeawn. Brush control, establishing desirable grasses, and controlled grazing are conservation practices needed.

The major pasture grasses are improved bermudagrass, kleingrass, weeping lovegrass, switchgrass, clover, and vetch. The gravelly surface layer makes seedbed preparation difficult. These soils are droughty, low in fertility, and highly acidic. Conservation practices include shaping of mined areas, reseeding to adapted grasses, using a complete fertilizer in split applications, and controlled grazing. Lime is required in most areas.

The soils in this unit are suited to trees such as post oak, blackjack oak, cedar, and juniper. A few areas have been planted to pine.

Farm ponds provide water for livestock in areas that do not have flowing water. Areas underlain by bedrock may require chemical treatment or compaction to seal the bottoms and occasionally the sides.

The soils in this unit have potential for wildlife habitat. The thick stands of brush and trees provide good cover for deer, dove, turkey, and squirrel.

Straber soils are poorly suited to most urban uses. Limitations include shrinking and swelling with changes in moisture, very slow permeability, seepage, low strength, and corrosivity to uncoated steel and concrete. These limitations can be partly overcome by good design and careful installation.

These soils are moderately suited to most recreational uses. The limitations are very slow permeability, gravelly surface, and slope.

Rek soils are poorly suited to most urban uses. The main limitations are shrinking and swelling with changes in moisture, low strength that affects streets and roads, corrosivity to uncoated steel and concrete, and small stones on the surface. These soils are unsuited to septic tank absorption fields. Wetness and very slow permeability are the main limitations. These limitations can be partly overcome by good design and careful installation.

These soils are moderately suited to most recreational uses because of small stones.

Carmine soils are poorly suited to most urban uses. The main limitations are shrinking and swelling with changes in moisture, slow permeability, wetness, clayey subsoils, and corrosivity to uncoated steel and concrete.

These soils are poorly suited to most recreational uses. The limitation is small stones.

9. Padina

Well drained, moderately permeable soils that are very deep to sandy materials

This map unit consists of Padina soils on ridges and side slopes.

This unit makes up about 1 percent of the survey area. It is 81 percent Padina soils and 19 percent soils of minor extent.

Typically, the Padina soils have a yellowish brown fine sand surface layer 6 inches thick. The subsurface layer, from 6 to 58 inches, is very pale brown fine sand. The subsoil, from 58 to 80 inches, is sandy clay loam that is light brownish gray to 65 inches, white to 72 inches, and light gray to 80 inches. It is mottled in shades of gray, red, and brown. Reaction is strongly acid to slightly acid.

Soils of minor extent in this map unit are Crockett, Lufkin, Robco, and Uhland. The loamy Crockett soils are on convex upland ridges and side slopes and are moderately well drained. The loamy Lufkin soils are on nearly level uplands and are moderately well drained. The sandy Robco soils are on upland ridges and side slopes and are moderately well drained. The loamy Uhland soils are on nearly level flood plains.

Rangeland is the major land use. A few small areas are used for pasture and cropland.

Native vegetation is mostly oak with an understory of mid and tall grasses, such as bluestem, panicum, paspalum, and threeawn. Conservation practices include brush control and deferred grazing.

The main pasture plants are improved bermudagrass and weeping lovegrass. The soils are droughty and subject to wind erosion. Conservation practices include weed and brush control, using a

complete fertilizer in split applications, and controlled grazing. Some areas may need lime.

Padina soils are not used for row crops because they are droughty and potential yields are low. However, truck crops such as peanuts, tomatoes, and melons are grown. Conservation practices include controlling soil blowing, conserving moisture, and improving soil fertility.

The soils in this unit have potential for wildlife habitat. Deer and turkey are common. Where the brush is thick, escape and resting cover for deer is adequate.

Padina soils do not provide adequate material for pond construction. Seepage is also a problem. Most ponds in this unit are on the more clayey minor soils.

Padina soils are well suited to most urban uses. The main limitations are cave-ins when excavating these soils because of the loose sandy surface, and because they are poor filters for septic tank absorption fields.

These soils are poorly suited to most recreational uses because of the sandy surface layer.

Gently Sloping to Steep, Loamy Lost Pines Soils on Uplands

This group makes up 2 percent of Fayette County. The Burlewash and Winedale soils formed in shale and tuffaceous materials of the Caddell Formation. The landscape surface is gently sloping to steep. Native grasses include bluestem, panicum, paspalum, and threeawn. Trees include post oak, live oak, cedar, and loblolly pine.

These soils have clayey subsoils that restrict the movement of water and growth of roots. They are suited to loblolly pine and have the potential for timber production with good timber management.

The pine woodlands make desirable homesites; however, the soils in these areas have limitations that affect urban use. The main limitations are high shrink-swell potential, very slow permeability, depth to bedrock, low strength, and corrosivity to uncoated steel and concrete. These limitations can be partly overcome by good design and careful installation.

10. Burlewash-Winedale

Well drained and moderately well drained, very slowly permeable soils that are moderately deep to tuffaceous materials or weathered shale

This map unit consists of Burlewash soils on moderately sloping to steep uplands and Winedale soils on interstream divides, side slopes, and footslopes.

This unit makes up about 2 percent of the survey area. It is 61 percent Burlewash soils, 30 percent Winedale soils, and 9 percent soils of minor extent.

Burlewash soils are moderately deep, gently sloping to steep, and well drained. Typically, these soils have a grayish brown, very gravelly fine sandy loam surface layer 4 inches thick. The subsoil, to a depth of 34 inches, is yellowish red clay in the upper part and light brown sandy clay in the lower part. The substratum, to 40 inches, is light olive brown and light brownish gray interbedded tuffaceous sandstone. Reaction ranges from moderately acid in the upper part of the soil to extremely acid in the lower part.

Winedale soils are moderately deep, gently sloping, and moderately well drained. Typically, these soils have a brown gravelly fine sandy loam surface layer 7 inches thick. The subsoil, to a depth of 37 inches, is clay that is yellowish red and brown in the upper part and light yellowish brown in the lower part. The substratum, to 62 inches, is clay with 40 percent fragments of weakly consolidated mudstone that is light yellowish brown and very pale brown. Reaction is very strongly acid in the upper part of the soil and extremely acid in the lower part.

Soils of minor extent in this map unit are Arol, Carmine, Singleton, and Warda. The loamy Arol soils are on nearly level to gently sloping upland ridge divides, saddles, and along drainageways. The loamy Carmine soils are on stream divides and side slopes. The loamy Singleton soils are on interstream divides and side slopes. The loamy Warda soils are on nearly level flood plains.

Woodland is the major land use. Other areas are used for rangeland and pasture.

Woodland areas consist of loblolly pine and scattered oaks. The woodland areas are part of the Lost Pines Forest. The pine trees are harvested for sawlogs and pulpwood. Conservation practices include brush control, insect infestation control, and fire protection.

Native vegetation consists of pine and scattered oaks with an understory of mid and tall grasses, such as bluestem, panicum, paspalum, and threeawn. Conservation practices include brush control and deferred grazing.

The main pasture plants are improved bermudagrass, kleingrass, lovegrass, and clover. Conservation practices include weed and brush control, using a complete fertilizer and lime, and controlled grazing.

The soils in this unit have potential for wildlife habitat. Deer, dove, and turkey are common. Dense brush provides escape and resting sites for deer.

Farm ponds provide water for livestock in areas that do have flowing water. The substratum may not permit

adequate material for pond construction. Usually a chemical treatment or suitable material will be needed for the bottom and sides of the pond to hold water. Monitoring acidic conditions is necessary for fish production.

Burlewash soils are poorly suited to most urban uses. The shrinking and swelling of the subsoil with changes in moisture, the low strength that affects streets and roads, depth to rock, high clay content in the subsoil, and corrosivity to uncoated steel and concrete are the main limitations. The very slow permeability of the subsoil is a limitation to septic tank absorption fields. These limitations can be partly overcome by good design and careful installation.

These soils are poorly suited to most recreational uses. The very slow permeability, slope, and depth to bedrock are limitations.

Winedale soils are poorly suited to most urban uses. The main limitations are shrinking and swelling with changes in moisture, corrosivity to uncoated steel and concrete, low strength, very slow permeability, and clayey subsoils. These limitations can be partly overcome by good design and careful installation.

These soils are moderately suited to recreational uses. The main limitation is very slow permeability.

Dominantly Nearly Level and Very Gently Sloping, Loamy and Clayey Soils on Terraces of the Colorado River

This group of general soil map units makes up 6 percent of Fayette County (fig. 8). The Wilson, Branyon, and Ships soils formed in clayey alluvium. The Gholson, Smithville, and Dutek soils formed in sandy and loamy alluvium. The landscape surface is nearly level and very gently sloping. Native grasses are bluestem and switchgrass. Trees are mainly oak, elm, and pecan.

Most of the soils in this group are suited to crops such as corn, small grains, forage and grain sorghums, peanuts, and truck crops. Surface drainage is needed in some areas, and the sandy soils are subject to wind erosion. Improved bermudagrass, gordo bluestem, old world bluestem, kleingrass, johnsongrass, switchgrass, and legumes are suitable pasture plants. Using a complete fertilizer increases crop and forage yields.

Most areas of these soils that overlook the Colorado River valley make desirable homesites. The soils in this group have limitations that affect urban use. The main limitations are high shrink-swell potential, slow and very slow permeability, seasonal wetness, low strength, corrosivity to uncoated steel, and seepage. These limitations can be partly overcome by good design and careful installation.

11. Wilson-Branyon-Ships

Moderately well drained, very slowly permeable, very deep soils that formed in clayey alluvium

This map unit consists of Wilson soils on smooth ancient terraces and slightly depressional residual uplands, Branyon soils on stream terraces, and Ships soils on depressional edges of wide flood plains.

This unit makes up about 4 percent of the survey area. It is 37 percent Wilson soils, 25 percent Branyon soils and similar soils, 16 percent Ship soils, and 22 percent soils of minor extent.

Typically, the Wilson soils have a clay loam surface layer 10 inches thick that is dark grayish brown in the upper part and dark gray in the lower part. The silty clay subsoil extends to a depth of 80 inches. It is dark gray in the upper part, gray in the middle part, and light gray in the lower part. These soils are moderately acid in the upper part and neutral in the lower part.

Typically, the Branyon soils have a dark gray clay surface layer and subsurface layer 16 inches thick. The upper part of the subsoil, to a depth of 59 inches, is dark gray clay. From 59 to 75 inches, the lower part of the subsoil is dark grayish brown clay with yellowish brown mottles. These soils are neutral to moderately alkaline.

Typically, the Ships soils have a dark reddish brown clay surface layer 5 inches thick. The subsurface layer, to a depth of 31 inches, is dark reddish brown clay. The subsoil, to a depth of 80 inches, is reddish brown clay. These soils are moderately alkaline.

Soils of minor extent in this map unit are Burleson, Crockett, Gholson, Krum, Rabbs, Roetex, and Trinity. The clayey Burleson soils are on ancient stream terraces. The loamy Crockett soils are on convex upland ridges and side slopes. The loamy Gholson soils are on terraces above the Colorado River flood plain. The clayey Krum soils are on nearly level low stream terraces of the Colorado River and are well drained. The loamy Rabbs soils are on side slopes between flood plains and low terraces. The clayey Roetex soils are on nearly level flood plains of the Colorado River and are somewhat poorly drained. The clayey Trinity soils are on nearly level flood plains associated with the Colorado River.

Cropland is the major land use. Other areas are used for pasture and rangeland. Some areas in this unit are mined for sand and gravel.

Crops grown on this unit are small grain crops, corn, and forage and grain sorghums. In areas that are nearly level, surface drainage may be needed. In some of these soils, the surface soil can be saturated for brief periods following heavy rains. This can delay planting

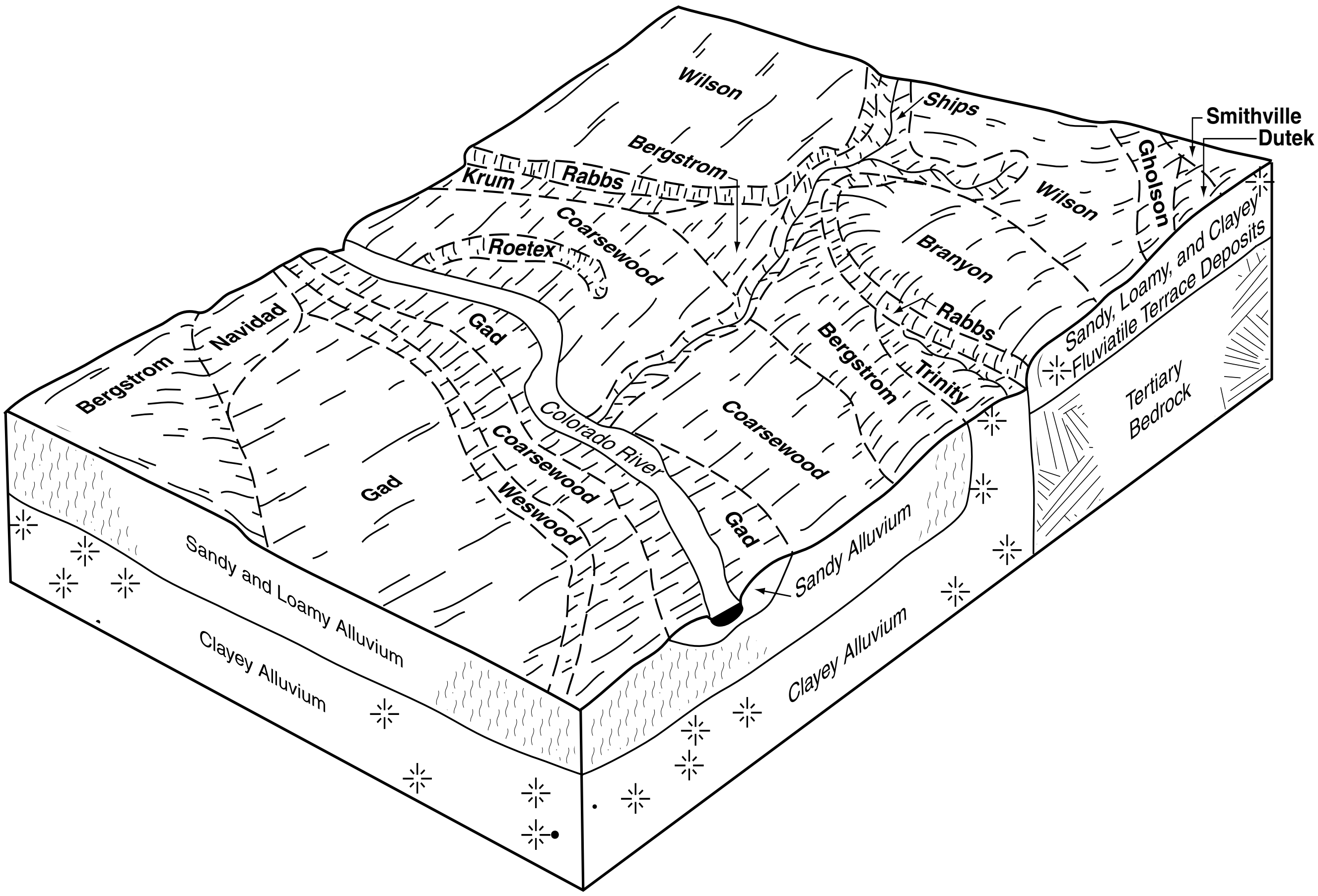

Figure 8.—Pattern of soils and underlying material in the terraces and flood plains of the Colorado River.

in the spring and harvesting in the fall. The clayey surfaces are difficult to work and crust when dry. Using plants that leave a large amount of crop residue will add to the tilth and keep the surface from drying. Cool-season legumes add to the fertility and tilth.

The main pasture grasses are improved bermudagrass, old world bluestem and gordo bluestem, johnsongrass, and singletary peas. When the soils are wet, heavy grazing causes compaction. Conservation practices include fertilization, weed control, and controlled grazing.

Rangeland vegetation consists of short to tall grasses with a scattered overstory of oak and elm trees. Brush control, proper stocking, and deferred grazing are recommended conservation practices.

The soils in this unit have potential for wildlife. Much of the land in this unit is used as cropland. However, deer, dove, and quail forage on plants found on this unit. The lack of cover for protection, escape, and nesting limits the type of wildlife.

Wilson soils are poorly suited to most urban uses. The limitations that affect urban uses are shrinking and swelling with changes in moisture, corrosivity to uncoated steel and concrete, very slow permeability, low strength, and clayey subsoil. These limitations can be partly overcome by good design and careful installation.

These soils are poorly suited to recreational uses. Very slow permeability is a limitation.

Branyon soils are poorly suited to most urban uses. The main limitations are shrinking and swelling with changes in moisture, corrosivity to uncoated steel, low strength, and very slow permeability. These limitations can be partly overcome by good design and careful installation. Under certain conditions, trench sidewalls can become highly unstable in these soils. Trenches that have been excavated more than 5 feet deep, should be shored to ensure safe working conditions.

These soils are poorly suited to most recreational uses. The main limitations are the clayey surface

texture that is sticky when wet and cracks when dry and very slow permeability.

Ships soils are poorly suited to most urban and recreational uses because of flooding, shrink-swell potential, very slow permeability, corrosivity to uncoated steel, and clayey texture. Protection against cave-ins should be used when excavating these soils.

12. Gholson-Smithville-Dutek

Well drained, moderately permeable, very deep soils that formed in sandy and loamy alluvium

This map unit consists of Gholson soils on terraces above the flood plain of the Colorado River, Smithville soils on low and mid terraces along the Colorado River and its major tributaries, and Dutek soils on ancient stream terraces.

This unit makes up about 2 percent of the survey area. It is 27 percent Gholson soils, 22 percent Smithville soils, 18 percent Dutek soils, and 33 percent soils of minor extent.

Typically, the Gholson soils have a brown very fine sandy loam surface layer and subsurface layer 14 inches thick. The subsoil extends to a depth of 80 inches. It is red sandy clay loam to 28 inches, reddish yellow loam from 28 to 49 inches, and reddish yellow fine sandy loam from 49 to 80 inches. These soils are neutral in the upper part and moderately alkaline in the lower part.

Typically, the Smithville soils have a grayish brown fine sandy loam surface layer 12 inches thick. The subsoil extends to a depth of 75 inches. It is sandy clay loam to 49 inches. It is very dark grayish brown from 12 to 21 inches, reddish brown from 28 to 38 inches, and yellowish red from 38 to 49 inches. From 49 to 75 inches, the subsoil is reddish yellow loam. The soil is neutral in the upper part and grades to moderately alkaline in the lower part.

Typically, the Dutek soils have a pale brown loamy fine sand surface layer 18 inches thick and a light yellowish brown loamy fine sand subsurface layer 8 inches thick. From 26 to 75 inches, the yellowish red subsoil is sandy clay loam in the upper part and fine sandy loam in the lower part. Reaction is moderately acid in the upper part of the soil and slightly acid in the lower part.

Soils of minor extent in this map unit are Branyon, Krum, Rabbs, Ships, and Trinity. The clayey Branyon soils are on stream terraces and are moderately well drained. The clayey Krum soils are on low stream terraces of the Colorado River. The loamy Rabbs soils are on side slopes between flood plains and low terraces. The clayey Ships soils are on depressional edges of wide flood plains and are moderately well drained. The clayey Trinity soils are on nearly level flood plains associated with the Colorado River. Some pits and dumps are also included. They are mainly on terraces of the Colorado River.

Cropland is the major land use. Other areas are used for pasture and many areas of this unit are mined for sand and gravel.

Crops grown on this unit are small grain crops, corn, forage and grain sorghums, peanuts, and truck crops. Some areas are used as orchards for fruit and nut production. Conservation practices include keeping a cover on the soil to prevent the surface from blowing, applying a complete fertilizer, and alternate stripcropping.

The main pasture grasses are improved bermudagrass, kleingrass, switchgrass, lovegrass, old world bluestem, and legumes. Conservation practices include controlled or rotational grazing, applying fertilizer in split applications, and controlling weeds.

The soils in this unit have potential for wildlife. Most areas provide little cover because of past and present land use. However, many of the plants that make up the food supply grow on this unit. Deer, dove, quail, and turkey are found throughout the area. Planting cool season grasses provides forage. The lack of cover for protection, escape, and nesting limit the type of wildlife.

Gholson soils are well suited to most urban uses. The main limitations are moderate permeability and seepage which affect septic tank absorption fields, sewage lagoons, and sanitary landfills.

These soils are well suited to most recreational uses.

Smithville soils are moderately suited to most urban uses. The limitations that affect urban use are shrink-swell potential, low strength, slow percolation, seepage, and corrosivity to uncoated steel. These limitations can be partly overcome by good design and careful installation.

These soils are well suited to most recreational uses.

Dutek soils are well suited to most urban uses. These soils are poor filters for septic tank absorption fields. Other limitations of the soil include seepage, risk of cave-ins, and corrosivity to uncoated steel.

The sandy surface is a limitation for most recreational uses because it erodes easily.

Nearly Level Soils on Flood Plains of the Colorado River and Local Streams

This group of general soil map units make up 9 percent of Fayette County. The Coarsewood, Gad, and Bergstrom soils formed in loamy and sandy alluvium

along the Colorado River. The Pursley, Ganado, and Degola soils formed in loamy and clayey alluvium along local streams. The landscape surface is nearly level flood plains. Native grasses are bluestem, switchgrass, paspalum, and panicum. Trees are mainly pecan, oak, elm, or hackberry.

Soils in this group are subject to flooding. Areas of these soils that are only rarely or occasionally flooded are suited to corn, small grains, and forage and grain sorghums. Other crops grown are cotton, alfalfa, and some truck crops. Improved bermudagrass, kleingrass, switchgrass, and legumes are adapted pasture plants.

These soils are not suited to homesites or most other urban uses. The main limitation is flooding.

13. Coarsewood-Gad-Bergstrom

Somewhat excessively drained and well drained, moderately permeable to rapidly permeable, very deep soils that formed in sandy and loamy alluvium

This map unit consists of Coarsewood and Gad soils on the flood plain of the Colorado River and Bergstrom soils on low terraces of the Colorado River.

This unit makes up about 4 percent of the survey area. It is 32 percent Coarsewood and similar soils, 24 percent Gad soils, 21 percent Bergstrom soils, and 23 percent soils of minor extent.

Coarsewood soils are well drained and have moderately rapid permeability. Typically, these soils have a brown silt loam surface layer 7 inches thick. The subsoil, to a depth of 45 inches, is silt loam that is reddish brown and brown. To a depth of 64 inches, it is light brown very fine sandy loam. The substratum to 80 inches is light yellowish brown very fine sandy loam. These soils are moderately alkaline throughout.

Gad soils are somewhat excessively drained and are rapidly permeable. Typically, these soils have a brown loamy fine sand surface layer 11 inches thick. The underlying material, to a depth of 80 inches, is light yellowish brown loamy fine sand in the upper part, and light yellowish brown loamy fine sand stratified with light brown bands of fine sand and brown fine sandy loam. These soils are moderately alkaline throughout.

Bergstrom soils are well drained and are moderately permeable. Typically, these soils have a brown to very dark grayish brown silt loam surface layer and subsurface layer 28 inches thick. The subsoil, to a depth of 56 inches, is brown silt loam. The substratum, to 80 inches, is strong brown silt loam. These soils are moderately alkaline throughout.

Soils of minor extent in this map unit are Krum, Navidad, Rabbs, Roetex, and Weswood. The clayey Krum soils are on nearly level, low stream terraces. The loamy Navidad soils are on nearly level flood plains. The loamy Rabbs soils are on side slopes between flood plains and low terraces. The clayey Roetex soils are in slack water areas and in swales or old channels. They are somewhat poorly drained. The loamy Weswood soils are on flood plains of the Colorado River.

Cropland is the major land use. Other areas are used for pasture and rangeland. Some areas are used for pecan orchards.

Crops grown on this unit are small grain crops, corn, and forage and grain sorghums. Soybeans, alfalfa, cotton, clover, and vetch are also grown. Conservation practices include varying the depth of tillage to keep plowpans from forming, conserving moisture, and leaving crop residue on the surface to help conserve moisture and prevent soil blowing.

The main pasture grasses are improved bermudagrass, kleingrass, switchgrass, old world bluestem, arrowleaf clover, and vetch. The sandy soils of this unit have low to very low available moisture capacity. Conservation practices include weed control, fertilization in split applications, and controlled grazing.

Rangeland vegetation, where present, is a mixture of tall grasses under trees. Conservation practices include controlling brush and trees, reseeding to desired grasses, and controlled grazing.

The soils in this unit are well suited to trees such as pecan, elm, hackberry, live oak, and ash. Many of the native pecans as well as improved varieties are harvested for nuts. In areas that do not have flowing water, ponds provide water for livestock. All the soils in this unit have limitations for building stock ponds. Generally, a chemical treatment or better material is necessary to seal the bottoms and the sides of the ponds.

The soils in this unit have potential for wildlife habitat. Deer, dove, quail, and turkey are common. The food supply is variable and limited in some areas. Areas where the trees or brush are dense allow good resting and nesting sites. The trees provide good roosting areas for turkey. Tall grasses provide good cover and food for wildlife.

Coarsewood soils are not suited to urban uses. The main limitation is flooding.

These soils are moderately suited to some recreational uses. The limitation is flooding.

Gad soils are not suited to urban uses. The main limitations are flooding and seepage. They are also poor filters for septic tank absorption fields.

These soils are moderately suited to most recreational uses. Flooding is the main limitation as well as the sandy surface.

Bergstrom soils are not suited to most urban uses. The main limitation is flooding.

These soils are well suited to most recreational uses. Flooding is a limitation for camp areas.

14. Pursley-Ganado-Degola

Well drained and moderately well drained, very slowly permeable to moderately permeable, very deep soils that formed in loamy and clayey alluvium

This map unit consists of Pursley, Ganado, and Degola soils on flood plains of major creeks and streams.

This map unit makes up about 5 percent of the survey area. It is 40 percent Pursley soils, 21 percent Ganado soils, 12 percent Degola and similar soils, and 27 percent soils of minor extent.

Pursley soils are well drained and loamy. Typically, these soils have a dark grayish brown clay loam surface layer 14 inches thick. The subsoil, to a depth of 34 inches, is grayish brown loam. The substratum, to 80 inches, is grayish brown and dark grayish brown clay loam and loam. These soils are slightly alkaline in the surface layer and moderately alkaline below.

Ganado soils are moderately well drained and clayey. Typically, these soils have a very dark gray clay surface layer 12 inches thick. The subsoil, from 12 to 67 inches, is clay that is dark gray to very dark gray. The substratum, to 80 inches, is light gray sandy clay. These soils are slightly alkaline in the upper part and moderately alkaline in the lower part.

Degola soils are well drained and loamy. Typically, these soils have a dark gray loam surface layer 12 inches thick. The subsurface layer, to a depth of 36 inches, is dark gray sandy clay loam and clay loam. The underlying material, to 72 inches, is gray clay loam and sandy clay loam. The soil is neutral in the upper part and moderately alkaline in the lower part.

Soils of minor extent in this map unit are Bosque, Navidad, Uhland, and Warda. The loamy Bosque, Navidad, Uhland, and Warda soils are on slightly higher positions than those of the Pursley, Ganado, and Degola soils. Cropland is the major land use. Other areas are used for pasture and rangeland.

Crops grown on this unit are small grain crops, corn, and forage and grain sorghums. Cotton, alfalfa, and certain truck crops are also grown. Pecans are harvested in some areas. Flooding is the major limitation for crop production.

The main pasture grasses are improved bermudagrass, kleingrass, switchgrass, dallisgrass, johnsongrass, and legumes. Conservation practices include weed control, using a complete fertilizer, and controlled grazing.

Rangeland vegetation consists of mid and tall grasses with a scattered overstory of oak, elm, or hackberry. In many areas, past and current uses have eliminated native plants. Conservation practices include brush control and deferred grazing.

The soils of this unit are suited to trees such as pecan, elm, hackberry, live oak, and bur oak.

The soils in this unit have potential for wildlife habitat. Deer, dove, quail, squirrel, and furbearers are common. There is a wide and good selection of food for deer. Trees provide good resting and nesting sites and escape areas for wildlife. Some of the wetter areas provide habitat for waterfowl.

Pursley soils are not suited to urban and recreational uses. Flooding is the main limitation.

Ganado soils are not suited to urban and recreational uses. The limitations are shrink-swell potential, flooding, low strength, high clay content, corrosivity to uncoated steel, and very slow permeability. Protection against cave-ins should be used when excavating this soil.

Degola soils are not suited to urban use because of flooding.

This soil is moderately suited to most recreational uses. The limitation is flooding.

Detailed Soil Map Units

The map units delineated on the detailed maps at the back of this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information about each map unit is given under the heading "Use and Management of the Soils."

A map unit delineation on a map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Burlewash fine sandy loam, 2 to 5 percent slopes, is a phase of the Burlewash series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Elmendolf-Denhawken complex, 1 to 3 percent slopes, is an example.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits and Dumps, sandy, is an example.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see “Summary of Tables”) give properties of the soils and the limitations, capabilities, and potentials for many uses. The “Glossary” defines many of the terms used in describing the soils or miscellaneous areas.

ArA–Arol fine sandy loam, 0 to 2 percent slopes

This moderately deep, nearly level and very gently sloping, loamy soil is on upland ridge divides, saddles, and along drainageways. Surfaces are slightly concave to depressional. Areas are irregular in shape. They range from 5 to more than 150 acres in size, averaging about 90 acres.

The typical sequence, depth, and composition of the layers of this soil are–

Surface layer:
0 to 5 inches, moderately acid, light brownish gray fine sandy loam

Subsoil:
5 to 15 inches, moderately acid, very dark gray clay that has common fine and medium grayish brown mottles
15 to 23 inches, slightly acid, dark gray clay that has common fine and medium grayish brown mottles
23 to 37 inches, neutral, dark gray clay that has few fine grayish brown mottles

Underlying material:
37 to 54 inches, neutral, light brownish gray and light gray tuff

Important soil properties–

Available water capacity: low
Permeability: very slow
Drainage: moderately well drained
Runoff: medium
Water table: at a depth of 1.5 to 2.5 feet, perched, November to February
Root zone: moderately deep
Shrink-swell potential: low in surface layer, high in subsoil
Hazard of water erosion: slight
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Burlewash, Flatonia, Shalba, and Singleton soils. The Burlewash, Shalba, and Singleton soils are in higher positions on the landscape. The Flatonia soils are in positions similar to those of the Arol soil. The included soils make up less than 15 percent of the map unit.

This soil is used mainly for rangeland or improved pasture. The soils are used for cropland in a few areas.

The native rangeland vegetation is a mixture of mid and tall grasses and a thin overstory of oak trees. Most of the native areas have sparse to dense stands of trees and brush. Effective conservation practices include brush control, reseeding, and controlled grazing.

Improved bermudagrasses is the pasture plant most suited to this soil. Other suitable plants include bahiagrass, old world bluestem, and singletary peas. Effective conservation practices include applying fertilizer and lime, controlling weeds, and controlling grazing.

This soil is poorly suited to cropland. Though once extensively cultivated to grow corn and cotton, only a few acres are used for peanuts, small grain crops, and forage sorghum. Water saturates the surface layer during periods of extended rainfall. The main limitations are the clayey subsoil and depth to bedrock. Other limitations are wetness, a hard and massive surface layer when dry, low natural fertility, and low organic matter content. Effective conservation practices include applying fertilizer and leaving plant residue on or near the surface to help conserve moisture and maintain tilth.

The soil has potential for wildlife habitat. Deer, turkeys, squirrels, doves, birds, and small animals inhabit areas of this soil. Yaupon, acorns, weeds, and small grain crops provide food and cover.

This soil is poorly suited to most urban uses. The main limitations are very slow permeability, clayey subsoil, seasonal wetness, low strength, high potential for shrinking and swelling with changes in moisture, and depth to bedrock. These limitations can be partly overcome by good design and careful installation.

This soil is moderately suited to most recreational uses. The main limitations are wetness, very slow permeability, and depth to bedrock.

This soil is in capability subclass 3w and the Claypan Savannah ecological site.

Bg—Bergstrom silt loam, rarely flooded

This very deep, nearly level, loamy soil is on low stream terraces of the Colorado River. The soil is protected from most flooding by large upstream dams. Surfaces are smooth to weakly undulating. Areas are irregular in shape. They range from 20 to more than 300 acres in size, averaging about 250 acres. Slopes are 0 to 1 percent.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 4 inches, moderately alkaline, dark grayish brown silt loam

Subsurface layer:
4 to 18 inches, moderately alkaline, very dark grayish brown silt loam
18 to 24 inches, moderately alkaline, dark brown silt loam
24 to 28 inches, moderately alkaline, brown silt loam

Subsoil:
28 to 56 inches, moderately alkaline, brown silt loam containing threads of calcium carbonate

Underlying material:
56 to 80 inches, moderately alkaline, strong brown silt loam containing threads of calcium carbonate

Important soil properties—

Available water capacity: high
Permeability: moderate
Drainage: well drained
Runoff: low
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: moderate
Hazard of water erosion: slight
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Krum, Ships, and Smithville soils. The Krum and Ships soils are in slight depressions. The Smithville soil is in slightly higher areas. The included soils make up less than 15 percent of the map unit.

Cropland and pasture are the major uses of this soil. Both native and improved pecans are suitable.

This soil is well suited to cropland and is used for small grain crops, grain and forage sorghum, and corn production. Alfalfa, soybean, cotton, arrowleaf clover, and other legumes are well suited. The root zone is very deep and is easily penetrated by plant roots. Effective conservation practices include leaving crop residue on the surface to conserve moisture and maintain tilth and productivity. Varying the depth of tillage can prevent a plowpan from developing.

This soil is well suited to pasture. Improved bermudagrasses, switchgrass, kleingrass, and vetch are suitable pasture plants. Effective conservation practices include applying fertilizer, controlling weeds, and controlling grazing.

This soil has potential for wildlife habitat. Deer, dove, and quail inhabit the areas and it produces suitable winter forage plants for deer.

This soil is not suited to most urban uses. The main limitation is the hazard of flooding.

This soil is well suited to most recreational uses; however, the hazard of flooding is severe for camp areas.

This soil is in capability class 1 and the Loamy Bottomland ecological site.

BkB—Bleiblerville clay, 1 to 3 percent slopes

This very deep, very gently sloping, clayey soil occupies concave upland ridges and areas along drainageways. Uncultivated areas have gilgai microrelief. The microlows are ponded for short durations following heavy rains. Areas are oval to elongated. They range from 20 to 300 acres in size, averaging about 150 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 10 inches, neutral, very dark gray clay

Subsoil:
10 to 23 inches, slightly alkaline, very dark gray clay that has few intersecting slickensides and common pressure faces
23 to 45 inches, slightly alkaline, dark gray clay that has common slickensides and pressure faces
45 to 65 inches, slightly alkaline, gray clay that has common concretions and soft masses of calcium carbonate
65 to 80 inches, slightly alkaline, gray and light gray clay that has yellow mottles

Important soil properties—

Available water capacity: high
Permeability: very slow
Drainage: moderately well drained
Runoff: medium
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: very high
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with this soil in mapping are areas of Frelsburg and Hallettsville soils. The Frelsburg and Hallettsville soils are in higher positions on the landscape than those of the Bleiblerville soils. The included soils make up less than 10 percent of the map unit.

Cropland and pasture are the major uses of this soil. It is suited to cropland and used for corn, forage

sorghum, and grain sorghum. The main limitation is wetness. This soil is difficult to work when wet or dry. When dry, deep, wide cracks extend from the surface to a depth of about 50 inches. When wet, the cracks are sealed and water enters the soil very slowly. Effective conservation practices include applying fertilizer, planting legumes, and leaving crop residue on or near the surface to conserve moisture, maintain tilth, and provide ease in plant root penetration.

This soil is well suited to pasture. Improved bermudagrasses, old world bluestem, switchgrass, kleingrass, johnsongrass, vetch, and sweetclover are suitable pasture plants. Effective conservation practices include applying fertilizer, controlling weeds, and controlling grazing.

This soil has potential for wildlife habitat. It is suited to doves and quail when it is used for grain and seed crops and adequate cover is present.

This soil is poorly suited to most urban uses. The main limitations are the potential for shrinking and swelling with changes in moisture, corrosivity to uncoated steel, low strength, and very slow permeability. These limitations can be partly overcome by good design and careful installation. Sometimes, trench sidewalls can become highly unstable in these soils. Trenches that have been excavated to a depth of more than 5 feet should be shored to ensure safe working conditions.

This soil is moderately suited to most recreational uses. The main limitations are very slow permeability and the clayey surface layer that cracks when dry and is sticky when wet.

This soil is in capability subclass 2e and the Blackland ecological site.

Bo—Bosque sandy clay loam, occasionally flooded

This very deep, nearly level, loamy soil is on flood plains of larger streams. On the average, this soil is flooded 1 or more times each 3 to 20 years. Floods occur briefly during periods of high rainfall in spring and fall months. Surfaces are smooth. Areas are oval to elongated. They range from 10 to 100 acres in size, averaging about 60 acres. Slopes are 0 to 1 percent.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 13 inches, slightly alkaline, very dark gray sandy clay loam

Subsurface layer:
13 to 28 inches, slightly alkaline, very dark grayish brown sandy clay loam

Subsoil:
58 to 80 inches, slightly alkaline, grayish brown sandy clay loam

Important soil properties—

Available water capacity: high
Permeability: moderate
Drainage: well drained
Runoff: low
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: low
Hazard of water erosion: slight
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Degola, Navidad, and Pursley soils. The Degola and Navidad soils are in positions on the landscape higher than those of the Bosque soil. The Pursley soils are adjacent to the stream channel. The included soils make up less than 15 percent of the map unit.

Cropland and pasture are the major uses of this soil. It is used for rangeland in a few areas.

This soil is well suited to cropland and is used for small grain crops, corn, and alfalfa. Native and improved varieties of pecans are grown on this soil, and it is suited to cotton and truck crops. It has high natural fertility. The root zone is very deep and easily penetrated by plant roots. Effective conservation practices include applying fertilizer and leaving crop residue on or near the surface to conserve moisture, lower soil temperature, and to maintain tilth and productivity.

This soil is well suited to pasture. Improved bermudagrasses, kleingrass, johnsongrass, and gordo bluestem are suitable pasture plants. Other adapted plants are old world bluestem, switchgrass, clover, and vetch. Effective conservation practices include applying fertilizer, controlling weeds, and controlling grazing.

This soil is well suited to rangeland. The climax plant community is a mixture of tall and mid grasses, forbs, and scattered shrubs and trees. Effective conservation practices that promote forage vigor are controlling brush and controlling grazing.

This soil has potential for wildlife habitat. Deer, doves, quail, and furbearers inhabit the areas where woods are near grain fields.

This soil is not suited to most urban uses. The main limitation is the hazard of flooding.

This soil is moderately suited to most recreational uses. The main limitation is the hazard of flooding.

This soil is in capability subclass 2w and the Loamy Bottomland ecological site.

BrA—Branyon clay, 0 to 1 percent slopes

This very deep, nearly level, clayey soil is on stream terraces. Surfaces are smooth. Areas are subrounded to elongated in shape. They range from 15 to 200 acres in size, averaging about 150 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 6 inches, neutral, dark gray clay

Subsurface layer:
6 to 16 inches, slightly alkaline, dark gray clay

Subsoil:
16 to 59 inches, slightly alkaline, dark gray clay that has many intersecting slickensides
59 to 75 inches, moderately alkaline, dark grayish brown clay containing yellowish brown mottles and many intersecting slickensides

Important soil properties—

Available water capacity: high
Permeability: very slow
Drainage: moderately well drained
Runoff: low
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: very high
Hazard of water erosion: slight
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Gholson, Rabbs, and Smithville soils. The Gholson and Smithville soils are in higher positions on the landscape than the Branyon soil. The Rabbs soil is on side slopes. Where the Rabbs soil is cultivated nearby, erosion has removed loamy material, depositing several inches on the surface of the Branyon soil. The included soils make up less than 15 percent of the map unit.

Cropland is the main use of this soil. It is used for pasture and rangeland in a few areas.

This soil is well suited to cropland. It is productive and used to grow corn and grain sorghum. It is also suited to cotton, small grain crops, and soybean. Soybean production is significantly reduced during hot and dry summers. The main limitation is wetness during planting season. The soil is difficult to work when wet or dry. When dry, deep, wide cracks extend to a depth of about 50 inches. The plant root zone is very deep, but penetration by plant roots is slow. Effective conservation practices include leaving crop residue on or near the surface and planting sweetclover to promote tilth and maintain organic matter content.

This soil is well suited to pasture (fig. 9). Improved bermudagrasses, gordo bluestem, old world bluestem, johnsongrass, kleingrass, and singletary peas are adapted pasture plants. Effective conservation practices include applying fertilizer, controlling weeds, and controlling grazing.

This soil is used for rangeland in a few places. The climax plant community is tall grasses and a few scattered oak, elm, and hackberry trees. Effective conservation practices include controlling brush, reseeding, and controlling grazing.

This soil has potential for wildlife habitat. Brush provides cover for birds and small game animals.

This soil is poorly suited to most urban uses. The main limitations are the potential for shrinking and swelling with changes in moisture, corrosivity to uncoated steel, low strength, and very slow permeability. These limitations can be partly overcome by good design and careful installation. Sometimes, trench sidewalls can become highly unstable in these soils. Trenches that have been excavated to a depth of more than 5 feet should be shored to ensure safe working conditions.

This soil is poorly suited to most recreational uses. The main limitations are the clayey surface layer that is sticky when wet and cracks when dry, slow runoff, and very slow permeability.

This soil is in capability subclass 2w and the Blackland ecological site.

BsD—Brenham clay loam, 3 to 8 percent slopes

This very deep, gently sloping and moderately sloping loamy soil is on uplands. Surfaces are plane to convex. Areas are irregular in shape. They range from 10 to 50 acres in size, averaging about 30 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 10 inches, moderately alkaline, dark grayish brown clay loam

Subsoil:
10 to 16 inches, moderately alkaline, light yellowish brown silty clay loam
16 to 30 inches, moderately alkaline, pale yellow silty clay loam that has strong brown mottles
30 to 38 inches, moderately alkaline, pale yellow silty clay loam that has brownish yellow mottles
38 to 80 inches, moderately alkaline, light yellowish brown silty clay that has yellowish mottles

Figure 9.—Raking johnsongrass for hay on Branyon clay, 0 to 1 percent slopes.

Important soil properties—

Available water capacity: high
Permeability: moderate
Drainage: well drained
Runoff: high
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: moderate
Hazard of water erosion: severe
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Frelsburg and Latium soils. The Frelsburg soil is higher on the landscape. The Latium soil is in positions on the landscape similar to those of the Brenham soil. Infrequent, deep, uncrossable gullies are in a few areas. The included soils make up less than 15 percent of the map unit.

Rangeland and pasture are the major uses of this soil. It is used for cropland in a few places.

This soil is well suited to rangeland. The climax vegetation is mainly tall and mid grasses. The native forage is managed for hay in a few places.

This soil is well suited to pasture. Improved bermudagrasses and kleingrass are suitable pasture plants. Other suited plants include old world bluestem, gordo bluestem, arrowleaf clover, vetch, and sweetclover. Conservation practices needed for high yields are controlling weeds, applying fertilizer, and controlling grazing.

This soil is poorly suited to cropland. The main limitations are slope, runoff, and erosion. Corn, forage

sorghum, and small grain crops are grown in some areas. Natural fertility and content of organic matter are high. Effective conservation practices include controlling erosion, slowing runoff, maintaining fertility, leaving crop residue on or near the surface, contour farming, and terracing.

This soil has potential for wildlife habitat. Deer, doves, quail, and songbirds inhabit the areas. Forbs and grasses provide seed for game birds. Woody plants and forbs provide food for deer.

This soil is poorly suited to most urban uses. The main limitations are soil slippage, slope, high corrosivity to uncoated steel, low strength affecting streets and roads, seepage, and high clay content. These limitations can be partly overcome by good design and careful installation.

This soil is suited to selected recreational uses. The main limitation is slope.

This soil is in capability subclass 4e and the Clay Loam ecological site.

BuA—Burleson clay, 0 to 1 percent slopes

This very deep, nearly level, clayey soil is on upland ancient stream terraces. In undisturbed areas, surfaces are characterized by gilgai microrelief consisting of microknolls and microdepressions. Areas are irregular in shape. They range from 10 to more than 50 acres in size, averaging about 40 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 7 inches, slightly alkaline, dark gray clay

Subsurface layer:
7 to 21 inches, moderately alkaline, dark gray clay

Subsoil:
21 to 42 inches, moderately alkaline, dark gray clay that has many intersecting slickensides
42 to 61 inches, moderately alkaline, dark gray clay that has common medium grayish brown mottles and many intersecting slickensides
61 to 75 inches, moderately alkaline, gray clay that has common dark grayish brown mottles and many intersecting slickensides
75 to 80 inches, moderately alkaline, light brown clay

Important soil properties—

Available water capacity: high
Permeability: very slow
Drainage: moderately well drained
Runoff: low; water enters the soil rapidly when the soil is dry and cracked and very slowly when the soil is wet
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: high
Hazard of water erosion: slight
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Branyon, Gholson, Smithville, and Wilson soils. The Gholson and Smithville soils are in positions on the landscape higher than those of the Burleson soil. The Branyon and Wilson soils are in similar positions. The included soils make up less than 15 percent of the map unit.

Pasture and cropland are the major uses of this soil. A few areas are used for rangeland.

This soil is suited to pasture. Improved bermudagrasses and vetch are commonly grown for pasture. Early growing season wetness can restrict the kind of pasture grasses that can be grown. Grazing when the soil is wet causes compaction in the surface layer. Effective conservation practices include fertilization, weed control, and controlled grazing to maintain adequate stubble height.

This soil is suited to cropland. Crops grown are small grain crops, corn, and forage and grain sorghums. The soil is difficult to work. A thick crust forms on the surface when dry. The root zone is very deep, but penetration by plant roots is slow. Growing deep rooted, soil-improving crops and incorporating plant residue into the soil help maintain tilth and productivity and reduce surface crusting. Delaying cultivation until the soil is dry reduces compaction. Rows should be laid out to drain excess water.

This soil is suited to rangeland, but very few acres are used for this purpose. Native vegetation consists of mid and tall grasses and a few scattered trees along drainageways.

This soil has potential for wildlife habitat. Brush provides cover for birds and small game animals.

This soil is poorly suited to most urban uses. The potential for shrinking and swelling with changes in moisture, low strength, high clay content, seasonal wetness, very slow permeability, and corrosivity to uncoated steel are the main limitations. These problems can be partly overcome by good design and careful installation. Sometimes, trench sidewalls can become highly unstable in these soils. Trenches that have been excavated to a depth of more than 5 feet should be shored to ensure safe working conditions.

This soil is moderately suited to recreational use. The main limitations are a clayey surface layer that forms deep wide cracks when dry, and very slow permeability. Surface drainage is needed.

This soil is in capability subclass 2w and the Blackland ecological site.

BwC—Burlewash fine sandy loam, 2 to 5 percent slopes

This moderately deep, gently sloping, loamy soil is on interstream divides, ridges, side slopes, and footslopes. Deep drainageways commonly dissect the side slopes and footslopes. Surfaces are plane to convex. Areas are irregular to elongated in shape. They range from 15 to more than 150 acres in size, averaging about 90 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 4 inches, very strongly acid, brown fine sandy loam

Subsoil:
4 to 9 inches, very strongly acid, reddish brown clay that has dark red mottles
9 to 19 inches, very strongly acid, brown clay that has dark red mottles
19 to 26 inches, very strongly acid, light brown clay loam that has red mottles

Underlying material:
26 to 40 inches, very strongly acid, very pale brown and brown, weakly cemented tuffaceous sandstone

Important soil properties—

Available water capacity: very low
Permeability: very slow
Drainage: well drained
Runoff: medium
Water table: none within a depth of 6 feet
Root zone: moderately deep
Shrink-swell potential: low in the surface layer, high in the subsoil layers
Hazard of water erosion: moderate
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Kurten, Shalba, Shiro, and Singleton soils. The gravelly Kurten soil is in positions on the landscape similar to those of the Burlewash soil. The Shalba and Shiro soils are in similar convex areas. The Singleton soil is on side slopes and in large smooth areas. Areas of eroded soils are also included. The included soils make up as much as 20 percent of the map unit.

Rangeland and pasture are the major uses of this soil. A few acres are in cropland.

Native rangeland areas consist of mid and tall grasses beneath an overstory of scattered oak trees. Heavy, woody plants such as oak, pine, juniper, yaupon, haws, and elm have shaded out most of the grasses where grazing has been continuous. These areas can be improved by removing brush, reseeding to quality range plants, and deferring or controlling grazing.

This soil is limited to use as pasture because of the low available water capacity and acidic soil conditions. Seedbed preparation is not difficult, but when left bare, the soil is subject to water and wind erosion. Improved bermudagrasses, lovegrass, kleingrass, arrowleaf clover, and singletary peas are commonly grown pasture plants. Effective conservation practices include controlling weeds, adding lime and a complete fertilizer, and controlling grazing to maintain adequate stubble height.

Very few acres of this soil are used to grow crops. Cultivated areas are planted to small grain crops, peanuts, and forage sorghum. Yields are low because of droughtiness, high acidity, and low natural fertility. In most areas, cropping is limited by deep, natural drainageways. Growing crops that produce large amounts of residue and leaving the residue on the surface help conserve moisture, reduce crusting and soil blowing, and improve soil tilth. Terraces are needed to help reduce erosion and slow surface runoff.

This soil has potential for wildlife habitat. A wide variety of native forbs, bushes, and grasses grow on this soil and provide food and cover for deer, turkeys, and other smaller game birds.

This soil is poorly suited to most urban uses. The potential for shrinking and swelling of the subsoil with changes in moisture, the low strength that affects streets and roads, high clay content in the subsoil, and corrosivity to uncoated steel and concrete are the main limitations. A limitation affecting septic tank absorption fields is very slow permeability of the subsoil. These problems can be partly overcome by good design and careful installation.

This soil is moderately suited to most recreational uses. The very slow permeability and the depth to rock are limitations.

This soil is in capability subclass 4e and the Claypan Savannah ecological site.

BwE—Burlewash very gravelly fine sandy loam, 5 to 20 percent slopes

This moderately deep, strongly sloping and moderately steep, very gravelly, loamy soil is on uplands dissected by many small drainageways. About 40 percent of the surface area is rounded siliceous

gravel. In some areas, the gravels include broken fragments of angular hard sandstone less than 10 inches across the long axis. The gravel and fragments are more abundant on the upper slopes. The surfaces are convex. Areas are elongated to irregular in shape. They range from 15 to 200 acres in size, averaging about 60 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 4 inches, moderately acid, grayish brown very gravelly fine sandy loam

Subsoil:
4 to 20 inches, extremely acid, yellowish red clay
20 to 34 inches, extremely acid, light brown sandy clay that has yellowish brown mottles

Underlying material:
34 to 40 inches, very strongly acid, light olive brown and light brownish gray interbedded sandstone

Important soil properties—

Available water capacity: low
Permeability: very slow
Drainage: well drained
Runoff: high
Water table: none within a depth of 6 feet
Root zone: moderately deep
Shrink-swell potential: low in the surface layer, high in the subsoil
Hazard of water erosion: severe
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Koether, Kurten, and Shalba soils. The Koether and Shalba soils have a paralithic contact with tuffaceous sandstone within a depth of 20 inches. The Kurten soil is on smoother slopes. A few areas on narrow ridgetops contain thick gravelly surface layers. In other areas, most of the gravel has been removed by mining. The included soils make up as much as 20 percent of the map unit.

This soil is used for pasture, rangeland, and for growing pine trees.

A few of the lower sloping areas of this soil are used to grow improved bermudagrasses, bahiagrass, arrowleaf clover, vetch, and kleingrass. Controlling weeds, grazing, and adding lime and a complete fertilizer increase grass production.

Most of this soil is in wooded rangeland. These areas commonly have a thick canopy and sparse grass. Mid and tall grasses grow in areas where the canopy is open. In some areas, the canopy is dominated by pine. In other areas, it is a mixture of pine, oaks, and juniper. The pine trees are harvested for sawlogs and pulpwood. The woodland areas can be maintained or improved by protecting them from fire, removing or controlling inferior plants, planting suitable plants, and selectively harvesting the trees on a planned schedule. The main limitations for woodland use are steepness of slopes, clayey subsoil, and erosion. Forage production can be increased in those areas not used for growing commercial timber by controlling brush, reseeding, and controlling grazing.

This soil has potential for wildlife habitat. Deer, turkeys, squirrels, and doves inhabit the areas, although turkeys do not have tall grasses for nesting. Controlling brush in strips or patterns increases the food supply for wildlife. Ponds built on this soil are in acidic materials. The water should be monitored for acidic conditions if they are used for fish production.

This soil is poorly suited to most urban uses. The potential for shrinking and swelling with changes in the moisture, depth to bedrock, very slow permeability, low strength affecting streets and roads, small stones, the severe hazard of erosion, and high corrosivity to uncovered steel and concrete are limitations.

This soil is poorly suited to most recreational uses. The main limitations are slope, hazard of erosion, and small stones. When loamy fill material is used and a good grass cover is maintained, some limitations are overcome.

This soil is in capability subclass 6e and the Gravelly ecological site.

BwF—Burlewash very gravelly fine sandy loam, 20 to 45 percent slopes

This moderately deep, steep, very gravelly, loamy soil is on uplands dissected by many small drainageways. Rounded siliceous gravels average 50 percent of the surface layer and cobbles average 2 to 5 percent. In some areas, the gravel and cobbles include broken fragments of angular, hard sandstone less than 10 inches across the long axis. The gravel and cobbles are more abundant on the upper slopes. The surfaces are convex. Areas are elongated to irregular in shape. They range from 35 to 300 acres in size, averaging about 120 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 4 inches, very strongly acid, grayish brown very gravelly fine sandy loam

Subsurface layer:
4 to 12 inches, very strongly acid, light brownish gray very gravelly fine sandy loam

Subsoil:
12 to 22 inches, extremely acid, brown clay
22 to 34 inches, extremely acid, light brown clay

Underlying material:
34 to 40 inches, extremely acid, light yellowish brown siltstone

Important soil properties—

Available water capacity: low
Permeability: very slow
Drainage: well drained
Runoff: very high
Water table: none within a depth of 6 feet
Root zone: deep
Shrink-swell potential: low in the surface layer, high in the subsoil
Hazard of water erosion: severe
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Koether and Shalba soils. The Koether and Shalba soils have a paralithic contact with tuffaceous sandstone within a depth of 20 inches. Also included are areas where the slope is less than 20 percent and more than 45 percent. The included soils make up less than 20 percent of the map unit.

This soil is used for rangeland, wildlife habitat, and for growing pine trees.

Most of this soil is wooded rangeland. Areas commonly have sparse grass and a thick canopy of loblolly pine. Mid and tall grasses are in areas where the canopy is open. Some areas have been harvested for sawlogs and pulpwood. The woodland areas can be maintained or improved by protecting from fire, removing inferior plants, planting adapted trees, and selectively harvesting the trees on a planned schedule. The main limitations for woodland use are steepness of slope, clayey subsoil, and erosion.

This soil has potential for wildlife habitat. Deer, doves, squirrels, and quail inhabit the areas. Acidic conditions are common in ponds built on these soils. The water should be monitored if used for fish production.

This soil is not suited to urban or recreational uses. The main limitations are slope, depth to bedrock, high potential for shrinking and swelling, low strength, very slow permeability, erosion, and small stones.

This soil is in capability subclass 7e and the Gravelly ecological site.

CaB—Cadell very fine sandy loam, 1 to 3 percent slopes

This deep, very gently sloping, loamy soil is on stream divides and side slopes. The surfaces are plane to convex. Areas are irregular to oblong in shape. They range from 8 to more than 200 acres in size, averaging about 80 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 5 inches, slightly acid, light brownish gray very fine sandy loam

Subsoil:
5 to 17 inches, neutral, brown clay loam that has few reddish brown mottles
17 to 24 inches, slightly alkaline, grayish brown clay loam that has few yellowish brown mottles
24 to 35 inches, slightly alkaline, pale brown clay containing grayish brown mottles and masses and concretions of calcium carbonate
35 to 43 inches, slightly alkaline, pale yellow clay that contains brownish and yellowish mottles, masses and concretions of calcium carbonate and gypsum

Underlying material:
43 to 60 inches, slightly alkaline, pale olive tuffaceous clay containing brownish yellow mottles and clusters of gypsum crystals
60 to 80 inches, neutral, light gray clay that has olive yellow mottles

Important soil properties—

Available water capacity: moderate
Permeability: very slow
Drainage: moderately well drained
Runoff: high
Water table: At a depth of 1.5 to 3.5 feet, perched, October to May
Root zone: deep
Shrink-swell potential: low in surface layer, high in subsoil
Hazard of water erosion: moderate
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Burlewash and Flatonia soils. The Burlewash soils are in positions on the landscape higher than those of the Cadell soil. The Flatonia soil is lower on the landscape. The included soils make up as much as 15 percent of the map unit.

Rangeland and pasture are the major uses of this soil. A few areas are used for cropland.

The climax vegetation is a savannah of mid and tall grasses and an overstory of post oak. Invasion of mesquite is common. Effective conservation practices include controlling brush, reseeding, and proper stocking with planned grazing.

Suited pasture plants are improved bermudagrasses, weeping lovegrass, kleingrass, old world bluestem, vetch, and arrowleaf clover. Effective conservation practices include weed control, fertilization, and planned grazing to maintain adequate stubble height.

In some areas, this soil is planted to small grain crops and forage sorghum. The surface layer forms a crust when dry. The dense subsoil does not absorb much rainfall, causing considerable runoff. The amount of available moisture is often inadequate for crops to grow well in summer. Effective conservation practices include maintaining a good supply of plant nutrients and a favorable structure. Terracing and farming on the contour are also needed to reduce water erosion. Crop residue left on or near the surface helps slow runoff, conserve moisture, maintain tilth, and lower soil temperature.

Habitat potential is high for doves, quail, turkeys, and deer. Using brush control in patterns increases food supply for wildlife. Small grain crops provide additional winter grazing.

This soil is poorly suited to most urban uses. The main limitations are shrinking and swelling of the subsoil with changes in moisture, wetness, low strength, very slow permeability, clayey subsoil, and corrosivity to uncoated steel. These limitations can be partly overcome by good design and careful installation.

This soil is moderately suited to recreational uses. The main limitation is wetness.

This soil is in capability subclass 3e and the Claypan Prairie ecological site.

CbC—Carbengle sandy clay loam, 3 to 5 percent slopes

This moderately deep, gently sloping, loamy soil is on upland ridges and side slopes. The surface is convex. Areas are oblong to irregular in shape. They range from 8 to 140 acres in size, averaging about 50 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 10 inches, moderately alkaline, dark grayish brown sandy clay loam

Subsoil:
10 to 21 inches, moderately alkaline, light yellowish brown loam that has few soft masses of calcium carbonate
21 to 33 inches, moderately alkaline, very pale brown clay loam that has common soft masses, threads, and concretions of calcium carbonate

Underlying material:
33 to 40 inches, moderately alkaline, white and very pale brown weakly cemented platy sandstone

Important soil properties—

Available water capacity: low
Permeability: moderate
Drainage: well drained
Runoff: medium
Water table: none within a depth of 6 feet
Root zone: moderately deep
Shrink-swell potential: low
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Frelsburg, Hallettsville, Renish, and Schulenburg soils. The Frelsburg soil is in positions on the landscape similar to those of the Carbengle soil. The Hallettsville soil is in lower positions, and the Renish and Schulenburg soils are higher on the landscape. The included soils make up less than 15 percent of the map unit.

Rangeland and pasture are the major uses of this soil. Some of the less sloping areas are used as cropland.

In rangeland areas, this soil produces excellent yields of native mid and tall grasses. Effective conservation practices include proper stocking, brush control, and planned grazing systems.

Improved bermudagrasses and kleingrass have been established on this soil. It is also suited to arrowleaf clover, vetch, and weeping lovegrass. Fertilization, weed control, and planned grazing systems are essential for maximum forage production.

This soil is used for growing small grain crops, forage and grain sorghums, and corn. These soils are easy to work. They absorb water readily, but their inability to store high amounts of available water limits production. Terraces and contour farming help reduce runoff and erosion. Crop residue left on or near the surface helps maintain organic matter, reduce erosion, and maintain soil tilth. The high content of calcium carbonate can cause iron chlorosis in sensitive plants.

This soil has good potential for wildlife habitat. Several of the forbs and grasses provide seed and cover for doves, quail, rabbits, and songbirds. Lack of

woody plants in some areas limits the cover for deer; however, certain grasses and forbs are used by deer where wooded areas are nearby.

This soil is moderately suited to most urban uses. The limitations are slope and depth to bedrock. The native live oak trees are scenic and make excellent shade.

This soil is well suited to most recreational uses. Depth of bedrock and slope are the limitations for playgrounds.

This soil is in capability subclass 3e and the Clay Loam ecological site.

CbD—Carbengle sandy clay loam, 5 to 8 percent slopes

This moderately deep, moderately sloping, loamy soil is on uplands. Areas follow contours of hills and ridges. The surfaces are convex. Areas range from 10 to 75 acres in size, averaging about 30 acres. Slopes average about 7 percent.

The typical sequence, depth, and composition of the layers of this soil are:

Surface layer:

0 to 6 inches, moderately alkaline, dark gray sandy clay loam

Subsurface layer:

6 to 14 inches, moderately alkaline, dark grayish brown loam

Subsoil:

14 to 23 inches, moderately alkaline, grayish brown loam that has very dark grayish brown mottles

23 to 28 inches, moderately alkaline, pale brown loam

Underlying material:

28 to 40 inches, moderately alkaline, white weakly cemented silt loam that has pale brown mottles

40 to 45 inches, moderately alkaline, white weakly cemented very fine sandy loam

45 to 48 inches, moderately alkaline, white weakly cemented sandstone

Important soil properties—

Available water capacity: low
Permeability: moderate
Drainage: well drained
Runoff: high
Water table: none within a depth of 6 feet
Root zone: moderately deep
Shrink-swell potential: low
Hazard of water erosion: severe
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Brenham, Latium, and Renish soils. The Brenham and Latium soils are on side slopes. The Renish soil is higher on the landscape. The included soils make up less than 15 percent of the map unit.

Rangeland is the major use of this soil. A few areas are used for pasture and cropland.

The climax plant community is dominated by mid and tall grasses. Effective conservation practices include using proper stocking rates and planned grazing systems so the tall grasses will not be grazed out and replaced by less desirable species of grasses, weeds, and brush.

Pasture areas were formerly used as cropland but are now used for growing kleingrass, old world bluestem, arrowleaf clover, vetch, weeping lovegrass, or improved bermudagrasses. Controlling weeds, using a complete fertilizer, and maintaining adequate forage stubble height help maintain forage vigor and increase production.

In some areas, this soil is used for growing small grain crops, corn, and forage sorghum. Most farming is limited because of past erosion and the current severe hazard of erosion. The soil has adequate drainage; however, the amount of available moisture is often too low for crops to grow well in summer. Terraces and contour farming help reduce runoff and erosion. Crop residue left on or near the surface help to maintain organic matter, improve soil tilth, reduce soil temperature, and reduce erosion.

The potential for wildlife habitat is good. Areas are inhabited by doves, quail, rabbits, and deer and adequate food is available for birds. Areas also provide supplemental grazing for deer along wooded drainageways, live oak motts, and where adjacent protective cover is abundant.

This soil is moderately suited to urban uses. The main limitations are slope and depth to bedrock.

This soil is well suited to most recreational uses. Slope and depth to bedrock are limitations.

This soil is in capability subclass 4e and Clay Loam ecological site.

CbE4—Carbengle-Gullied land complex, 5 to 12 percent slopes

This map unit consists of moderately deep, strongly sloping, loamy Carbengle soil and gullied areas on uplands. Slopes are slightly convex and average 9 percent. Vertical-walled gullies, 6 to 40 feet wide and 2 to 12 feet deep, dissect the area at intervals of 40 to 200 feet. These gullies cut into the cemented sandstones of the Jackson and Oakville formations. About 20 to 60 percent of the areas are composed of

gullies; most average about 50 percent. In some of the areas of Carbengle soil, a large part of the surface layer has been removed by sheet erosion. Areas are irregular in shape. They range from 10 to 100 acres in size, averaging about 60 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 5 inches, moderately alkaline, dark grayish brown sandy clay loam

Subsurface layer:
5 to 15 inches, moderately alkaline, dark grayish brown loam

Subsoil:
15 to 32 inches, moderately alkaline, very pale brown loam with few white concretions of calcium carbonate

Underlying material:
32 to 47 inches, moderately alkaline, light brownish gray weakly cemented loam

Important soil properties—

Available water capacity: low
Permeability: moderate
Drainage: well drained
Runoff: high
Water table: none within a depth of 6 feet
Root zone: moderately deep
Shrink-swell potential: low
Hazard of water erosion: severe
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of gullied Brenham, Latium, and Renish soils. Erosion has removed most of the surface layer from these soils. The included soils make up less than 25 percent of the map unit.

This soil is used mainly for rangeland and wildlife habitat. The deep gullies make these soils unsuitable for pasture or cropland.

Mid and tall native grasses grow well on this soil where grazing is controlled. In areas where the grazing has been long and continuous, the desirable grasses have been replaced by annuals and poor quality perennials and invading brush and oak trees. As the grass cover thins, runoff increases and the gullies increase in width and length. Controlling brush and fencing areas off will reduce erosion and allow native grasses to regain their vigor and increase. Grazing should be controlled and limited. Some of the gullies make excellent pond sites; however, seepage is likely in certain areas. These areas are poorly suited to mechanical shaping, where the fertile topsoil is used to fill the gullies and thin, infertile layers of highly erodible subsoil remain.

This soil has potential for wildlife habitat. It produces forbs and annual grasses that are used by deer, quail, doves, and other wildlife. Controlling juniper and other brush increases the food supply and helps reduce erosion.

This soil is not suited to urban and recreational uses. Deep gullies, the severe hazard of erosion, depth to bedrock, and slope are the limitations.

This soil is in capability subclass 6e and the Clay Loam ecological site.

CeC—Carmine extremely gravelly very fine sandy loam, 2 to 5 percent slopes

This very deep, gently sloping, gravelly loamy soil is on stream divides and side slopes (fig. 10). Gravels and cobbles are mostly imbedded below the surface; however, in disturbed areas they are on the surface, which is plane to convex. Areas are oval to elongated in shape. They range from 15 to more than 100 acres in size, averaging about 60 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 7 inches, slightly acid, light yellowish brown, extremely gravelly very fine sandy loam that contains 65 percent siliceous pebbles
7 to 14 inches, slightly acid, pink, extremely gravelly very fine sandy loam that contains 65 percent pebbles

Subsurface layer:
14 to 36 inches, slightly acid, pink, extremely gravelly loamy coarse sand that contains 70 percent pebbles

Subsoil:
36 to 60 inches, extremely acid, light gray, very gravelly sandy clay loam that has 35 to 40 percent pebbles and 5 percent cobbles
60 to 65 inches, very strongly acid, light gray, sandy clay loam that has red mottles
65 to 80 inches, very strongly acid, white, sandy clay loam that has light gray mottles

Important soil properties—

Available water capacity: very low
Permeability: slow
Drainage: moderately well drained
Runoff: high to very high

Figure 10.—Stockpiles of cobbles and gravel are common on Carmine extremely gravelly very fine sandy loam, 2 to 5 percent slopes.

Water table: at a depth of 2.5 to 3.5 feet, perched, November to April
Root zone: very deep
Shrink-swell potential: very low in the surface layer, moderate in the subsoil
Hazard of water erosion: slight
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of gravelly Rek and Straber soils. The Rek soil is in lower positions on the landscape where gravel has been removed. The Straber gravelly soil has a surface less than 20 inches thick and is in positions similar to those of the Carmine soil. Included are soils that have less than 35 percent coarse fragments in the subsoil. Also included are small areas of a soil that has a surface layer that is either slightly thinner or slightly thicker than the Carmine soil. The included soils make up less than 25 percent of the map unit.

This soil is used mainly for rangeland. In a few areas, the soil is used for pasture. Many areas are strip mined for gravel.

Rangeland consists of mid and tall grasses and an overstory of oak trees, juniper, haws, and yaupon. Grass does not grow well because the gravelly layers supply little moisture and the woody vegetation is a strong competitor for moisture and light. Controlling brush by mechanical means leaves gravels and cobbles exposed on the surface. Controlling brush, reseeding, and deferring grazing help increase forage production and maintain grass vigor.

This soil is suited to pasture. Improved bermudagrasses, bahiagrass, weeping lovegrass, and vetch are suitable pasture plants. Applying a complete

fertilizer in split applications and applying lime increase grass production. Other effective conservation practices include controlling weeds and grazing.

This soil is poorly suited to most urban uses. The main limitations are very slow permeability, wetness, and corrosivity to uncoated steel and concrete.

This soil is poorly suited to most recreational uses. The limitation is small stones.

This soil is in capability subclass 4s and the Gravelly ecological site.

ChB—Chazos loamy fine sand, 1 to 3 percent slopes

This very deep, very gently sloping, sandy soil occupies upland stream divides and their side slopes. The surface is plane to slightly convex. Areas are irregular to oblong in shape. They range from 10 to 100 acres in size, averaging about 50 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 9 inches, slightly acid, light yellowish brown loamy fine sand

Subsurface layer:
9 to 13 inches, slightly acid, very pale brown loamy fine sand

Subsoil:
13 to 23 inches, slightly acid, mottled brownish yellow and light gray clay that has red mottles
23 to 31 inches, neutral, reddish brown clay that has light brownish gray and reddish gray mottles
31 to 45 inches, neutral, light brownish gray sandy clay loam that has yellowish red and brown mottles
45 to 60 inches, moderately alkaline, light yellowish brown sandy clay loam
60 to 74 inches, moderately alkaline, stratified very pale brown fine sandy loam, yellow sandy clay loam, and light yellowish brown weakly consolidated sandstone

Important soil properties—

Available water capacity: moderate
Permeability: slow
Drainage: moderately well drained
Runoff: medium
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: moderate in subsoil
Hazard of water erosion: moderate
Hazard of wind erosion: severe

Included with this soil in mapping are small areas of Gredge, Lufkin, and Robco soils. The Gredge soil is on side slopes, the Lufkin soil is in depressional areas, and the Robco soil is on ridges and along drainageways. The included soils make up less than 15 percent of the map unit.

This soil is used mostly for rangeland and pasture. In a few places, it is used for cropland.

This soil is extensively used for rangeland. Many old cropland fields are now in mid and tall native grasses. Some native wooded areas have degenerated to thick stands of trees and brush that have shaded out the grass.

This soil is suited to pasture. Improved bermudagrasses, weeping lovegrass, switchgrass, arrowleaf clover, and vetch are suitable pasture plants. Fertilization, weed control, and controlled grazing are needed for maximum production.

Peanuts, forage and grain sorghums, and small grain crops are adapted to this soil. Vineyards, melons, and truck crops are also adapted; however, the amount of available moisture is often inadequate for crops to grow well in the summer. The sandy surface layer is easy to work, but is susceptible to wind erosion when it is not protected with crop residue. When left on the soil surface, crop residue helps conserve moisture, slow runoff, reduce soil blowing, and maintain productivity. Alternating tall and short crops in strips and growing cover crops help reduce soil blowing.

The soil has potential for wildlife habitat. Deer, squirrels, doves, and quail inhabit the areas. They feed extensively on acorns, crop residue, and winter cover crops. Other small animals and birds feed, nest, and raise their young in areas of this soil. If brush is dense, habitat for most wildlife declines, although deer use the brush for escape and resting cover.

This soil is moderately suited to most urban uses. The main limitations are the potential for shrinking and swelling, slow permeability, clayey subsoil, low strength, and corrosivity to uncoated steel and concrete. These limitations can be partly overcome by good design and careful installation.

This soil is well suited to recreational uses.

This soil is in capability subclass 2e and the Loamy Sand ecological site.

Co—Coarsewood silt loam, occasionally flooded

This very deep, nearly level, loamy soil is on flood plains of the Colorado River. This soil is subject to flooding about once each 3 to 25 years. Areas are elongated to oval in shape. They range from 8 to more

than 100 acres in size, averaging about 90 acres. Areas not intensively cultivated have shallow channels and low ridges. Slopes range from 0 to 2 percent.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 7 inches, slightly alkaline, brown silt loam

Subsoil:
7 to 16 inches, slightly alkaline, reddish brown silt loam
16 to 25 inches, slightly alkaline, brown silt loam
25 to 37 inches, slightly alkaline, brown silt loam that has thin yellowish brown lenses
37 to 45 inches, slightly alkaline, reddish brown silt loam
45 to 64 inches, slightly alkaline, light brown very fine sandy loam

Underlying material:
64 to 80 inches, slightly alkaline, light yellowish brown very fine sandy loam

Important soil properties—

Available water capacity: moderate
Permeability: moderately rapid
Drainage: well drained
Runoff: low
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: low
Hazard of water erosion: slight
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Gad, Navidad, and Weswood soils. The frequently flooded Gad soil is along the river. The Navidad and Gad soils are in slightly higher positions on the landscape and are occasionally flooded. The Weswood soil is in positions similar to those of the Coarsewood soil. The included soils make up less than 15 percent of the map unit.

The soil is used for cropland, pasture, and rangeland. Improved pecans are adapted to this soil.

This soil is easily cultivated throughout a wide range of moisture conditions. It is a productive soil suited to small grain crops, corn, peanuts, alfalfa, and forage and grain sorghums. It is also suited to growing cotton, soybean, and truck crops. Some areas are used for growing pecans (fig. 11). Land smoothing is needed in some areas to remove surface irregularities. The high content of calcium carbonate throughout the soil causes iron chlorosis in sensitive plants. Conservation practices are needed to maintain or improve tilth and soil structure.

Pastures are mainly improved bermudagrasses and scattered native pecan trees. Other adapted pasture plants are old world bluestem, switchgrass, kleingrass, white clover, arrowleaf clover, and vetch. Conservation practices needed for maintaining forage production are weed control, fertilization, and controlled grazing to maintain adequate stubble height.

Areas of this soil used as rangeland are wooded. The main native trees are oak, elm, pecan, ash, hackberry, cottonwood, and willow trees. In most areas, these trees have increased in density where most of the mid and tall grasses are shaded out. Conservation practices needed for range improvement are controlling and thinning woody vegetation, reseeding, and controlling grazing.

This soil has potential for wildlife habitat. Areas are inhabited by deer, doves, squirrels, and other small furbearers. The soil provides adequate food for turkeys, but tall grasses for nesting sites are lacking. Many of the choice forage plants for deer are produced on this soil. Excellent resting and escape cover are present or nearby.

This soil is not suited to urban uses. The main limitations are the hazard of flooding and seepage.

This soil is suited to some recreational uses. The hazard of flooding is a limitation.

This soil is in capability subclass 2w and the Loamy Bottomland ecological site.

CrB—Crockett loam, 1 to 3 percent slopes

This deep, very gently sloping, loamy soil occupies convex upland ridges and side slopes. Areas are irregular in shape. They range from 5 to 110 acres in size, averaging about 60 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 9 inches, slightly acid, brown loam

Subsoil:
9 to 16 inches, slightly acid, brown clay that has common yellowish brown and reddish mottles
16 to 29 inches, slightly alkaline, light olive brown clay that has few yellowish brown mottles
29 to 42 inches, moderately alkaline, brownish yellow clay loam that has few reddish yellow mottles
42 to 47 inches, moderately alkaline, brownish yellow clay loam that has common reddish yellow mottles

Underlying material:
47 to 62 inches, moderately alkaline, stratified light gray and light brownish gray clay that has common yellowish brown mottles and many crystals of gypsum

Figure 11.—Pecan orchards are suited to Coarsewood silt loam, occasionally flooded.

62 to 74 inches, moderately alkaline, stratified light brownish gray clay that has yellow mottles and common crystals of gypsum
74 to 80 inches, moderately alkaline, stratified yellowish brown clay that has crystals of gypsum

Important soil properties—

Available water capacity: moderate
Permeability: very slow
Drainage: moderately well drained
Runoff: medium
Water table: none within a depth of 6 feet
Root zone: deep
Shrink-swell potential: low in surface, high in subsoil
Hazard of water erosion: moderate
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Kurten, Normangee, and Wilson soils. The Kurten and Normangee soils are in higher positions on the landscape. The Wilson soil is in slightly lower positions. The included soils make up less than 20 percent of the map unit.

This soil is used mainly for pasture and rangeland.

Many areas that were once cultivated are now planted to coastal bermudagrass. Other adapted pasture plants include kleingrass, weeping lovegrass, old world bluestem, arrowleaf clover, vetch, and singletary peas. Effective conservation practices include brush and weed control, fertilization, and controlled grazing to maintain adequate stubble height.

On rangeland, this soil produces mid and tall native grasses when grazing is reasonably well managed. In many places, close grazing and trampling have reduced the capacity of the soil to absorb water and less desirable grasses, weeds, and brush have invaded and replaced the better grasses. Effective conservation practices include proper stocking, brush control, and planned grazing systems.

This soil is used for producing small grain crops and forage and grain sorghums. The soil has adequate drainage, but the amount of available moisture is often inadequate for crops to grow well in the summer. Crop residue left on the surface helps maintain organic matter, improve tilth, and reduce erosion. Terraces help

control runoff and erosion, and act as a guide for cultivating on the contour.

This soil has potential for wildlife habitat. Quail and doves inhabit the areas. Deer and turkeys feed in the areas and use cover on adjacent soils. Tall grasses are used as nesting sites by turkeys.

This soil is poorly suited to urban uses. The main limitations are the potential for shrinking and swelling with changes in moisture, very slow permeability that affects septic tank absorption fields, and low strength of the clayey subsoil that affects streets and roads. These limitations can be partly overcome by good design and careful installation.

This soil is moderately suited to most recreational uses. The main limitation is very slow permeability.

This soil is in capability subclass 3e and the Claypan Prairie ecological site.

Dg—Degola loam, occasionally flooded

This very deep, nearly level, loamy soil is on flood plains of larger streams that drain from sandy and loamy areas. On the average, this soil is flooded once or more each 3 to 20 years. Flooding occurs briefly during periods of high rainfall in spring and fall months. The surface is smooth. Areas are oval to elongated in shape. They range from 5 to 100 acres in size, averaging about 80 acres. Slopes are 0 to 1 percent.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 12 inches, neutral, dark gray loam

Subsurface layer:
12 to 26 inches, neutral, dark gray sandy clay loam
26 to 36 inches, neutral, dark gray clay loam

Underlying material:
36 to 42 inches, moderately alkaline, gray sandy clay loam
42 to 54 inches, moderately alkaline, gray clay loam that contains lenses and pockets of calcium carbonate
54 to 72 inches, moderately alkaline, gray sandy clay loam that contains lenses of calcium carbonate

Important soil properties—

Available water capacity: high
Permeability: moderate
Drainage: well drained
Runoff: low
Water table: none within a depth of 6 feet; flooding occasionally occurs
Root zone: very deep
Shrink-swell potential: low
Hazard of water erosion: slight
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Bosque, Ganado, Uhland, and Warda soils. The Bosque and Warda soils are in positions on the landscape similar to those of the Degola soil, and the Ganado soil is in low areas. The Uhland soil is along stream banks. The included soils make up less than 15 percent of the map unit.

This soil is used mainly for cropland or pasture. Both native and improved pecans are adapted to this soil.

This productive soil is used for growing small grain crops, forage and grain sorghums, and corn. It is also suited to cotton, alfalfa, and truck crops. Crops respond well to fertilizer. Leaving crop residue on the surface helps conserve moisture, lower soil temperature, and maintain tilth and productivity.

Adapted pasture plants include improved bermudagrasses, kleingrass, weeping lovegrass, and gordo bluestem. Other adapted pasture plants include old world bluestem, switchgrass, johnsongrass, arrowleaf clover, and vetch. Effective conservation practices include fertilization, weed control, and grazing at planned intervals.

This soil has potential for wildlife habitat. Areas are inhabited by deer, doves, quail, and furbearers.

This soil is not suited to urban use because of the hazard of flooding.

This soil is moderately suited to most recreational uses. The hazard of flooding is a limitation.

This soil is in capability subclass 2w and the Loamy Bottomland ecological site.

DnC—Dubina loamy fine sand, 2 to 5 percent slopes

This very deep, gently sloping, sandy soil is on upland stream divides and their side slopes. The surface is plane to convex. Areas are oval to irregular in shape. They range from 8 to 120 acres in size, averaging about 60 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 16 inches, slightly acid, dark brown loamy fine sand

Subsoil:
16 to 27 inches, slightly acid, brown sandy clay that has dark red and yellowish brown mottles
27 to 54 inches, slightly acid, mottled reddish yellow, red, and light gray sandy clay

54 to 70 inches, neutral, strong brown sandy clay loam that has light gray and yellowish brown mottles
70 to 80 inches, moderately alkaline, brownish yellow fine sandy loam

Important soil properties—

Available water capacity: moderate
Permeability: slow
Drainage: moderately well drained
Runoff: medium
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: high in upper subsoil, moderate in lower subsoil
Hazard of water erosion: moderate
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Carbengle, Hallettsville, and Knolle soils. The Carbengle and Knolle soils are in higher positions on the landscape. The Hallettsville soil is in lower positions. The included soils make up less than 20 percent of the map unit.

This soil is used mainly for pasture and rangeland. It is cultivated in a few places.

Adapted pasture grasses are improved bermudagrasses, weeping lovegrass, and bahiagrass. Cool-season legumes, such as vetch, crimson clover, and arrowleaf clover, produce winter forage while adding nitrogen to the soil. Fertilization, weed control, and controlled grazing help improve yields and maintain vigor.

Rangeland vegetation is mid and tall grasses and scattered live oak motts and a few post oak trees. Some areas have degenerated to thick stands of trees and brush. Rangeland production can be increased with range conservation practices, such as controlled grazing and brush control.

Most of this soil has been cultivated to small grain crops, corn, cotton, forage and grain sorghums, and peanuts. It is also suitable for vineyards. The root zone is very deep. However, the high clay content of the lower layers slows root penetration and causes water to temporarily perch above the subsoil during periods of high rainfall. The soil is easily cultivated, though bare areas are subject to wind erosion. Effective conservation practices include leaving crop residue on the surface to help conserve moisture, slow runoff, reduce soil blowing, and maintain productivity. Contour farming and conservation tillage help reduce soil erosion.

This soil has potential for wildlife habitat. Deer, rabbits, squirrels, doves, and quail inhabit the areas. Several forbs and grasses provide quality seed for game birds and animals. A good selection of forbs is available for deer.

This soil is moderately suited to most urban uses. The main limitations are the potential for shrinking and swelling with changes in soil moisture, slow permeability, clayey subsoil, and corrosivity to uncoated steel. These limitations can be partly overcome by good design and careful installation. A thick, protective vegetative cover helps prevent water erosion and soil blowing.

This soil is well suited to most recreational uses.

This soil is in capability subclass 3e and the Loamy Sand ecological site.

DtB—Dutek loamy fine sand, 1 to 3 percent slopes

This very deep, very gently sloping, sandy upland soil is on ancient stream terraces. The surface is plane to convex. Areas are oval to elongated in shape. They range from 10 to more than 300 acres in size, averaging 70 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 18 inches, moderately acid, pale brown loamy fine sand

Subsurface layer:
18 to 26 inches, moderately acid, light yellowish brown loamy fine sand

Subsoil:
26 to 49 inches, slightly acid, yellowish red sandy clay loam
49 to 75 inches, slightly acid, yellowish red fine sandy loam

Important soil properties—

Available water capacity: moderate
Permeability: moderate
Drainage: well drained
Runoff: low
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: low
Hazard of water erosion: moderate
Hazard of wind erosion: severe

Included with this soil in mapping are areas of Branyon, Ganado, Gholson, and Trinity soils. The Branyon and Ganado soils are in lower positions on the landscape. The Gholson soil is in positions similar to those of the Dutek soil, except it has a loamy surface

layer less than 20 inches thick. The Trinity soil is on flood plains. The included soils make up less than 25 percent of the map unit.

This soil is used mainly for pasture. It is used as cropland in a few places. A few large areas are strip mined for sand and gravel.

Adapted pasture plants include improved bermudagrasses, weeping lovegrass, switchgrass, indiangrass, vetch, and arrowleaf clover. Effective conservation practices include fertilization at planned intervals, weed control, and controlled grazing. Planting grass in old crop residue provides protection from soil erosion. The residue also helps maintain soil moisture.

Peanuts, melons, corn, small grain crops, grain sorghum, and forage sorghum are adapted to this soil. Vineyards, fruits, and nuts are also adapted. Effective conservation practices include preventing soil erosion and maintaining tilth and fertility. Growing cool-season legumes and leaving crop residue on the surface help maintain soil fertility and control soil blowing. Planting crops, such as grain sorghum, melons, and peanuts, in alternate strips also helps reduce soil erosion.

This soil has potential for wildlife habitat. Deer, turkeys, squirrels, quail, and doves inhabit wooded or brushy areas. Other small animals and birds feed, rest, and raise their young in areas of this soil. If brush is dense, habitat for most wildlife declines, although deer use the brush for escape and resting cover.

This soil is well suited to most urban uses. The main limitations are poor filtration that affects septic tank absorption fields, seepage, cutbanks cave, and corrosivity to uncoated steel.

The sandy surface layer is a limitation to most recreational uses because it erodes easily.

This soil is in capability subclass 3s and the Loamy Sand ecological site.

EdD2—Edge gravelly fine sandy loam, 5 to 12 percent slopes, eroded

This deep, strongly sloping, loamy soil is on hill slopes and narrow stream divides. Most areas are wooded and dissected by many natural drainageways. Some of the drainageways are deeply gullied. Continual erosion between juniper trees has removed 2 to 4 inches of topsoil and has exposed the subsoil layer in places. Many previously cultivated areas have shallow, and a few deep gullies about 50 to 250 feet apart. The reddish subsoil is exposed on upper slopes. Rounded siliceous gravels and a few cobbles are on the surface and imbedded in the surface layer. The gravel and cobbles average about 15 percent of the surface layer. The surface is convex. Areas are elongated in shape. They range from 10 to 200 acres in size, averaging 100 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 5 inches, slightly acid, yellowish brown, gravelly fine sandy loam

Subsoil:
5 to 19 inches, moderately acid, reddish brown clay
19 to 30 inches, strongly acid, reddish brown clay that has brownish mottles
30 to 36 inches, slightly acid, yellowish red clay loam that has brownish and reddish mottles
36 to 46 inches, slightly acid, light yellowish brown clay loam that has brownish mottles and fragments of shale

Underlying material:
46 to 64 inches, neutral, stratified light yellowish brown fine sandy loam and brown clay

Important soil properties—

Available water capacity: moderate
Permeability: very slow
Drainage: well drained
Runoff: high
Water table: none within a depth of 6 feet
Root zone: deep
Shrink-swell potential: low in surface layer, high in upper part of subsoil, moderate in lower part of subsoil
Hazard of water erosion: severe
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Gredge and Zack soils. The Gredge and Zack soils are on ridgetops and footslopes. Also included are long and narrow areas that have slopes greater than 12 percent and a few deeply gullied areas 3 to 5 acres in size. The included soils and gullied areas combined make up less than 20 percent of the map unit.

This soil is used for rangeland. It is used as pasture in a few places. It is not used as cropland because of low natural fertility, rapid runoff, clayey subsoil, and the severe hazard of water erosion. Most rangeland areas have a ground cover of mid and tall native grasses and an overstory of post oak, blackjack oak, elm, hawthorn, yaupon, loblolly pine, and juniper. Mesquite and juniper are invading areas previously used for cropland. As juniper thickens, the native grasses die or decrease, causing high runoff that easily erodes the bare soil. Effective conservation practices include controlling brush, shaping gullies, reseeding, and controlling grazing and erosion.

A few of the less sloping and smoother areas of the Edge soil are used for growing improved bermudagrasses and kleingrass. Other adapted pasture plants include old world bluestem, arrowleaf clover, and vetch. Fertilization, weed control, and controlled grazing are essential to maintain plant vigor and increase forage production.

This soil has potential for wildlife habitat. Areas provide good cover for deer, quail, doves, and turkeys. The tall grass makes excellent turkey nesting sites. Overgrazing causes a decline in quality plants.

This soil is poorly suited to urban uses. The limitations are the clayey subsoil, low strength, very slow permeability, corrosivity to uncoated steel, slope, and hazard of erosion.

This soil is poorly suited to most recreational uses. The limitations are very slow permeability, slope, and hazard of erosion.

This soil is in capability subclass 6e and the Claypan Savannah ecological site.

EfB—Elmendorf-Denhawken complex, 1 to 3 percent slopes

This is a complex of very deep, very gently sloping, loamy soils on uplands. These soils are cyclic. The map unit consists of the Elmendorf soils in microdepressions and the Denhawken soils on microknolls. In native or undisturbed areas, the microknolls are 5 to 12 inches higher than the microdepressions. The microdepressions are about 7 to 50 feet wide, averaging a few feet wider than the microknolls. These soils occur in parallel or linear bands up and down the slopes. The vegetation pattern is distinct. The vegetation on the Elmendorf soil is dense and tall; it is sparse and short on the Denhawken soil. The Elmendorf soil makes up about 52 percent of the complex, averaging 35 to 65 percent. The Denhawken soil makes up about 48 percent of the complex, averaging 35 to 65 percent. Other soils make up 5 to 10 percent. Areas range from 30 to more than 200 acres in size. These soils are so intricately mixed that separation is not practical at the scale of mapping used.

The typical sequence, depth, and composition of the layers of this Elmendorf soil are—

Surface layer:
0 to 5 inches, neutral, dark grayish brown loam

Subsoil:
5 to 13 inches, neutral, very dark gray clay loam
13 to 27 inches, slightly alkaline, dark gray clay loam
27 to 40 inches, slightly alkaline, yellowish brown clay
40 to 54 inches, slightly alkaline, pale yellow clay that has common crystals of gypsum
54 to 66 inches, slightly alkaline, pale yellow clay that has common crystals of gypsum
66 to 80 inches, slightly alkaline, pale yellow clay that has many crystals of gypsum

Important soil properties—

Available water capacity: high
Permeability: very slow
Drainage: well drained
Runoff: medium
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: high
Hazard of water erosion: moderate
Hazard of wind erosion: slight

The typical sequence, depth, and composition of the layers of this Denhawken soil are—

Surface layer:
0 to 7 inches, moderately alkaline, brown clay loam

Subsoil:
7 to 20 inches, moderately alkaline, light olive brown clay that has common fine concretions of calcium carbonate
20 to 43 inches, moderately alkaline, light olive brown clay that has many fine concretions of calcium carbonate
43 to 62 inches, moderately alkaline, mottled light olive brown and light brownish gray clay that has many medium crystals of gypsum

Underlying material:
62 to 80 inches, moderately alkaline, light olive gray clay that has common crystals of gypsum

Important soil properties—

Available water capacity: moderate
Permeability: very slow
Drainage: well drained
Runoff: medium
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: high
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with these soils in mapping are small areas of Crockett, Luling, and Normangee soils. These soils are in higher positions on the landscape than those of the Elmendorf and Denhawken soils. The included soils make up less than 10 percent of the map unit.

The Elmendorf and Denhawken soils are used mainly for rangeland. They are used as pasture and cropland in a few areas.

Native vegetation is mid and tall grasses except where grazing has been long and continuous. Heavily grazed areas and areas that reverted to rangeland after cultivation mainly have short and mid grasses and poor quality annuals. Many of these areas have been invaded by mesquite and oak trees; however, they can be improved by controlling brush, reseeding, and controlling grazing.

Some pasture areas are suited to improved bermudagrasses, kleingrass, gordo bluestem, and old world bluestem. Other adapted pasture plants include arrowleaf clover, sweetclover, and vetch. Fertilization is needed to improve production.

Many areas of these soils were previously cultivated to cotton and corn. A few areas are now used to grow small grain crops for cool-season pasture and to grow forage sorghum for pasture and hay. These soils have a surface layer that is very hard and difficult to till when dry. They form deep, wide cracks and a thick surface crust when they are dry. Effective conservation practices include controlling erosion and maintaining good tilth and favorable soil structure. Terraces and contour farming are needed to slow runoff and to reduce erosion. Growing deep-rooted legumes and leaving crop residue near the surface help maintain tilth and improve soil structure, conserve soil moisture, and slow runoff.

These soils have potential for wildlife habitat. Quail, doves, and rabbits inhabit the areas. Deer and turkeys browse in wooded areas. These soils produce forbs and grasses that provide seed for food. Lack of woody vegetation limits the use of some areas.

The Elmendorf and Denhawken soils are poorly suited to most urban uses. The main limitations are the potential for shrinking and swelling with changes in moisture, corrosivity to uncoated steel, low strength that affects streets and roads, and very slow permeability that affects septic tank absorption fields. These limitations can be partly overcome by good design and careful installation.

The Elmendorf and Denhawken soils are moderately suited to most recreational uses. The main limitations are very slow permeability and the clayey subsoil.

The Elmendorf soils are in capability subclass 2e and the Blackland ecological site. The Denhawken soils are in capability subclass 3e and the Blackland ecological site.

FaB—Flatonia loam, 1 to 3 percent slopes

This deep, very gently sloping, loamy soil is on footslopes, low ridges, and upland stream divides. The surface is plane to convex. Areas are irregular to somewhat oval in shape. They range from 20 to more than 200 acres in size, averaging 200 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 4 inches, slightly acid, dark gray loam

Subsoil:
4 to 14 inches, slightly acid, very dark gray clay
14 to 33 inches, neutral, dark gray clay
33 to 43 inches, slightly alkaline, light brownish gray silty clay
43 to 55 inches, slightly alkaline, light gray clay loam containing about 20 percent weakly cemented tuffaceous siltstone

Underlying material:
55 to 80 inches, slightly alkaline, white, weakly cemented tuffaceous siltstone

Important soil properties—

Available water capacity: moderate
Permeability: slow
Drainage: moderately well drained
Runoff: medium
Water table: at a depth of 3.5 to 5.0 feet, perched, October to May
Root zone: deep
Shrink-swell potential: high
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Arol, Greenvine, and Singleton soils. The Arol and Singleton soils have a loamy surface layer and are higher on the landscape. The clayey Greenvine soil is in positions similar to those of the Flatonia soil. Also included is a soil similar to the Flatonia soil that has a clay loam or sandy clay loam surface layer. The included soils make up less than 15 percent of the map unit.

This soil is used mainly for pasture and rangeland. A few acres are in cropland.

Adapted pasture grasses include gordo bluestem, old world bluestem, improved bermudagrasses, and kleingrass. Using a complete fertilizer, a weed control, and a rotational grazing method helps to maintain an adequate stubble height that is needed for maximum pasture and hay production.

Rangeland vegetation includes bluestem, panicum, and paspalum and scattered live oak and post oak trees. Where grazing is continuous and close, the oak trees increase and mesquite and juniper invade.

Effective conservation practices include brush control and controlled grazing to help maintain grass vigor.

Cropland areas are limited in extent; the main crops are small grain crops, corn, and forage and grain sorghums. Effective conservation practices include leaving crop residue on the surface, using cover crops, and farming on the contour. This soil has high natural fertility and high organic matter content.

This soil has potential for wildlife. Areas are inhabited by deer, doves, quail, and songbirds. Several grasses and forbs provide seed for game birds and animals. A good selection of forbs for deer forage is available and in some areas, tall grasses provide turkey nesting sites.

This soil is poorly suited to most urban uses. The main limitations are the potential for shrinking and swelling with changes in moisture, slow permeability, corrosivity to uncoated steel, depth to bedrock, and low strength. These limitations can be partly overcome by good design and careful installation.

This soil is well suited to most recreational uses.

This soil is in capability subclass 2e and the Clay Loam ecological site.

FrB—Frelsburg clay, 1 to 3 percent slopes

This very deep, very gently sloping clayey soil is on upland divides and side slopes. The surface is plane to convex. Uncultivated areas have gilgai microrelief. Areas are elongated and follow the contour of the landscape. They range from 15 to 450 acres in size, averaging 120 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 6 inches, slightly alkaline, very dark gray clay
6 to 10 inches, slightly alkaline, dark gray clay

Subsoil:
10 to 17 inches, moderately alkaline, gray clay that has few intersecting slickensides
17 to 39 inches, moderately alkaline, gray clay that contains common concretions of calcium carbonate and has common intersecting slickensides
39 to 70 inches, moderately alkaline, gray clay that contains many concretions of calcium carbonate and has many intersecting slickensides
70 to 80 inches, moderately alkaline, mottled light gray and light reddish brown clay that contains common concretions of calcium carbonate

Important soil properties—

Available water capacity: high
Permeability: very slow
Drainage: moderately well drained
Runoff: medium
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: very high
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Bleiblerville, Carbengle, Hallettsville, and Latium soils. The clayey Bleiblerville soil is in slightly lower positions on the landscape. The loamy Carbengle and Hallettsville soils are in higher positions. The Latium soil is on side slopes. The included soils make up less than 20 percent of the map unit.

This soil is used mainly for cropland. Some areas are used for pasture and rangeland. Adapted crops are small grain crops, corn, and grain sorghum. Soybean and cotton are also adapted. When this soil is dry, deep, wide cracks extend to the surface. Water enters the soil rapidly when the soil is cracked. When the soil is wet, the cracks are sealed, and water enters the soil very slowly. This soil is difficult to work during extremes in moisture content. The high content of calcium carbonate throughout the soil causes iron chlorosis in sensitive plants. Adequate moisture is available for most summer-grown plants, but plant root penetration through the clayey layers is slow. Terracing and contour farming are essential to reduce runoff and erosion. Growing deep-rooted legumes and leaving crop residue on or near the surface help reduce erosion and maintain tilth.

This soil is used for growing improved bermudagrasses, indiangrass, switchgrass, johnsongrass, kleingrass, vetch, and sweetclover. Effective conservation practices include fertilization, weed control, and controlled grazing to maintain proper plant height.

Rangeland vegetation is an open prairie of bluestem, switchgrass, grama, dropseed, and other grasses. Controlled grazing is important to maintain the more palatable plants and to continue high forage production.

This soil has potential for wildlife habitat. Doves, quail, and songbirds inhabit the areas. Sparse woody plants provide little protective cover. Deer use the areas for supplemental grazing along major drainageways where adjacent protective cover is abundant.

This soil is poorly suited to most urban uses. The main limitations are the potential for shrinking and swelling with changes in moisture, low strength, high clay content, and corrosivity to uncoated steel. The soil

is poorly suited to septic tank absorption fields because of very slow permeability. Protection against cave-ins is needed when this soil is excavated. These limitations can be partly overcome with good design and careful installation.

This soil is moderately suited to most recreational uses. The main limitations are the very slow permeability and clayey texture that cause the soil to form deep, wide cracks when it is dry and cause stickiness when wet.

This soil is in capability subclass 2e and the Blackland ecological site.

FrC—Frelsburg clay, 3 to 5 percent slopes

This very deep, gently sloping, clayey soil is on upland slopes. The surface is convex. Uncultivated areas have gilgai microrelief. Areas are elongated and follow the contour of the landscape. They range from 30 to 200 acres in size, averaging 120 acres.

The typical sequence, depth, and composition of the layers of this Frelsburg soil are—

Surface layer:
0 to 9 inches, moderately alkaline, dark gray clay

Subsoil:
9 to 51 inches, moderately alkaline, gray clay
51 to 66 inches, moderately alkaline, light gray clay that has many intersecting slickensides

Underlying material:
66 to 80 inches, moderately alkaline, light gray clay

Important soil properties—

Available water capacity: high
Permeability: very slow
Drainage: moderately well drained
Runoff: high
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: very high
Hazard of water erosion: severe
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Brenham, Carbengle, Hallettsville, and Latium soils. The loamy Brenham and Carbengle soils and the clayey Latium soil are in positions on the landscape similar to those of the Frelsburg soil. The loamy Hallettsville soil is in higher positions. The included soils make up less than 20 percent of the map unit.

This soil is used mostly for pasture. Some areas are used for cropland and rangeland.

This soil is suited to grain sorghum, corn, small grain crops, and hay crops. It is limited by slope, and when unprotected, allows much water and soil to be lost through runoff. Cotton was extensively grown on this soil. It has high natural fertility, but is difficult to work during extremes in the moisture content. When this soil is dry, deep, wide cracks extend to the surface. Water enters the soil rapidly when the soil is cracked. When the soil is wet, the cracks are sealed, and water enters the soil very slowly. The high content of calcium carbonate in this soil causes iron chlorosis in sensitive plants. Effective conservation practices include controlling erosion and maintaining tilth. Terracing and contour farming are essential to slow runoff and reduce erosion. Growing deep-rooted legumes and leaving crop residue on or near the surface help reduce erosion and maintain tilth.

Adapted grasses used for pasture include improved bermudagrasses, old world bluestem, switchgrass, johnsongrass, kleingrass, gordo bluestem, vetch, and sweetclover. Effective conservation practices include fertilization, weed control, and controlled grazing.

Many areas of this soil are used for rangeland. The native mid and tall grasses are excellent forage. Woody vegetation is mainly limited to major drainageways and fence rows; however, continuous overgrazing in some areas has caused desirable grasses to decrease and woody plants to invade.

This soil has potential for wildlife habitat. Small game birds inhabit the areas. Several grasses and forbs provide seed and cover. Deer feed in the area. Crop residue and certain woody plants provide additional food and cover.

This soil is poorly suited to most urban uses. The main limitations are the potential for shrinking and swelling with changes in moisture, corrosivity to uncoated steel, very slow permeability, low strength, high clay content, and slope. Protection against cave-ins is needed when this soil is excavated. These limitations can be partly overcome by good design and careful installation.

This soil is moderately suited to most recreational uses. The limitations include slope, very slow permeability, and a clayey surface layer that cracks when dry, and is sticky when wet.

This soil is in capability subclass 3e and the Blackland ecological site.

FrD—Frelsburg clay, 5 to 8 percent slopes

This very deep, moderately sloping, clayey soil is on side slopes of ridges. The surface is convex. Areas are oblong and follow the contour of the landscape.

They range from 7 to more than 60 acres in size, averaging 40 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 8 inches, moderately alkaline, dark gray clay

Subsoil:
8 to 24 inches, moderately alkaline, gray clay
24 to 52 inches, moderately alkaline, gray clay that contains common concretions of calcium carbonate
52 to 69 inches, moderately alkaline, light gray clay that contains few concretions of calcium carbonate

Underlying material:
69 to 80 inches, moderately alkaline, light gray silty clay that contains a few olive strata and streaks

Important soil properties—

Available water capacity: high
Permeability: very slow
Drainage: moderately well drained
Runoff: high
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: very high
Hazard of water erosion: severe
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Brenham, Carbengle, and Latium soils. The loamy Brenham and Carbengle soils and the clayey Latium soils are in positions on the landscape similar to those of the Frelsburg soil. The included soils make up less than 20 percent of the map unit.

This soil is used mainly for rangeland. A few acres are used for cropland.

The climax vegetation is a tall and mid grass prairie and a few elm, live oak, and hackberry trees along drainageways. If grazing is managed properly, the mid and tall grasses grow well.

A few acres of this soil are used for cropland such as small grain crops, corn, and forage sorghum. The rapid runoff that causes a severe erosion hazard is the main limitation. Using terraces and contour farming and growing closely spaced crops help reduce erosion. Leaving crop residue on the surface helps conserve moisture, reduces soil temperature, and maintains productivity.

This soil supplies adequate moisture to most warm-season pasture plants. Adapted plants include improved bermudagrasses, switchgrass, kleingrass, sweetclover, vetch, and old world bluestem. Establishing a good seedbed is difficult and the soil is droughty during the summer. Effective conservation practices include weed and brush control and controlled grazing.

This soil has potential for wildlife habitat. Doves, quail, and songbirds inhabit the areas. Sparse woody plants provide little protective cover. Excessive grazing reduces wildlife food and cover plants.

This soil is poorly suited to urban uses. Steep slopes, severe hazard of water erosion, potential for shrinking and swelling with changes in moisture, very slow permeability, and corrosivity to uncoated steel are the limitations. Protection against a cave-in is needed when this soil is excavated.

This soil is moderately suited to most recreational uses. The clayey surface layer, slope, and permeability are the limitations.

This soil is in capability subclass 4e and the Blackland ecological site.

Ga—Gad loamy fine sand, rarely flooded

This very deep, nearly level and very gently sloping, sandy soil is on flood plains of the Colorado River. Many of the uncultivated areas have a series of parallel, gently undulating ridges and swales. Areas of this soil are protected by large upstream structures, but flooding can occur under unusual circumstances. Areas are broad and oval to elongated in shape. They range from 20 to more than 300 acres in size, averaging 100 acres. Slopes range from 0 to 2 percent.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 10 inches, moderately alkaline, brown loamy fine sand

Underlying material:
10 to 18 inches, moderately alkaline, light yellowish brown loamy fine sand
18 to 46 inches, moderately alkaline, light brown loamy sand
46 to 80 inches, moderately alkaline, light yellowish brown fine sand

Important soil properties—

Available water capacity: low
Permeability: rapid
Drainage: somewhat excessively drained
Runoff: low
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: low

Hazard of water erosion: severe
Hazard of wind erosion: severe

Included with this soil in mapping are small areas of Coarsewood, Navidad, Weswood, and Bergstrom soils. The Coarsewood and Weswood soils are lower on the landscape and are occasionally flooded. The Bergstrom and Navidad soils are in positions similar to those of the Gad soil. The included soils make up less than 20 percent of the map unit.

This soil is used mostly for pasture and cropland. A few acres are used for rangeland.

Most of the pasture areas are used for growing improved bermudagrasses. Other suited pasture plants are weeping lovegrass, old world bluestem, johnsongrass, and arrowleaf clover. Low amounts of fertilizer are needed twice or more each year because plant nutrients are easily leached out of the plant root zone.

This soil is planted to peanuts, small grain crops, and melons; however, the cultivated acreage is small and yields are low because the soil stores low amounts of moisture. Leaving crop residue on or near the surface helps control soil blowing, conserve moisture, reduce soil temperature, and maintain productivity and tilth.

Tall grasses and a scattered canopy of woody plants, such as elm, live oak, pecan, cottonwood, and hackberry, are on well managed rangeland. Continued overgrazing decreases the tall grasses and increases woody plants, weeds, and annual grasses.

Native pecans are harvested in a few areas of this soil.

This soil has potential for wildlife habitat. Areas are inhabited by deer, doves, quail, and turkeys. Turkeys use the large trees for roosting and the tall grasses for nesting. This soil produces many of the forage plants for deer and turkeys. Sites for nesting, resting, and escape cover are also provided.

This soil is not suited to urban uses. The main limitations are the hazard of flooding, seepage, and poor filtration for septic tank absorption fields.

The soil is moderately suited to most recreational uses. The hazard of flooding and the sandy surface are limitations.

This soil is in capability subclass 3s and the Sandy Bottomland ecological site.

Gb—Gad loamy fine sand, occasionally flooded

This very deep, nearly level and very gently sloping, sandy soil is on the flood plains of the Colorado River. Many of the uncultivated areas contain a series of parallel, gently sloping ridges and swales. These areas are protected by large upstream structures. However, floods occur once or more every 10 to 40 years. Some areas are elongated and parallel the river channel. Other areas occupy the inside curves of the river and have a crescent shape. Areas range from 25 to more than 300 acres in size, averaging 100 acres. Slopes range from 0 to 2 percent.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 11 inches, moderately alkaline, brown loamy fine sand

Underlying material:
11 to 40 inches, moderately alkaline, light yellowish brown loamy fine sand that has strata of fine sand and fine sandy loam
40 to 80 inches, moderately alkaline, alternating strata of light yellowish brown loamy fine sand, light brown fine sand, and brown fine sandy loam

Important soil properties—

Available water capacity: low
Permeability: rapid
Drainage: somewhat excessively drained
Runoff: low
Water table: none within a depth of 6 feet; flooding occasionally occurs
Root zone: very deep
Shrink-swell potential: low
Hazard of water erosion: severe
Hazard of wind erosion: severe

Included with this soil in mapping are small areas of Coarsewood and Weswood soils. The silty Coarsewood soil is in slightly higher positions on the landscape. The silty Weswood soil is in higher positions. During periods of flooding, soil is deposited in some areas and is removed by scouring in other areas. The included soils make up to 25 percent of the map unit.

This soil is used mainly as pasture and rangeland. Some areas are used for cropland. A few acres are strip mined for sand and gravel.

Most of the pasture areas are planted in improved bermudagrasses. Other pasture plants are weeping lovegrass, old world bluestem, johnsongrass, and arrowleaf clover. Applications of a low amount of fertilizer are needed twice or more each year because certain plant nutrients are easily leached out of the plant root zone.

Tall grasses and a scattered canopy of woody plants, such as elm, live oak, pecan, cottonwood, and hackberry, are on well managed rangeland. Continued

overgrazing decreases the tall grasses and increases woody plants, weeds, and annual grasses.

This soil is suited to peanuts, small grain crops, and melons; however, the cultivated acreage is small and yields are low because the soil stores low amounts of moisture. Leaving crop residue on or near the surface helps control soil blowing, conserve moisture, reduce soil temperature, and maintain productivity and tilth.

Native pecans are harvested in a few areas of this soil.

This soil has potential for wildlife habitat. Areas are inhabited by deer, doves, quail, and turkeys. Turkeys commonly use the large trees for roosting and the tall grasses for nesting. Many of the forage plants for deer and turkey are produced on these soils. Sites for nesting, resting, and escape cover are also provided.

This soil is poorly suited to urban uses. The main limitations are the hazard of flooding, seepage, and poor filtration for septic tank absorption fields.

The soil is moderately suited to most recreational uses. The hazard of flooding and the sandy surface layer are the main limitations.

This soil is in capability subclass 4s and the Sandy Bottomland ecological site.

Gd—Gad fine sand, frequently flooded

This very deep, nearly level and very gently sloping, sandy soil is on the flood plains of the Colorado River (fig. 12). This map unit includes the river banks and the flood plain adjacent to the river that slopes upward to elevations that are only occasionally flooded. Areas are long and narrow along the river and crescent shaped along the river bends. They range from 10 to more than 200 acres in size, averaging 60 acres. Slopes range from 0 to 2 percent.

The typical sequence, depth and composition of the layers in this soil are—

Surface layer:
0 to 18 inches, moderately alkaline, light yellowish brown fine sand that contains thin strata of brownish fine sandy loam

Underlying material:
18 to 63 inches, moderately alkaline, pale brown fine sand that has many thin strata of brown fine sandy loam and very fine sandy loam
63 to 80 inches, moderately alkaline, pale brown fine sand

Important soil properties—

Available water capacity: low
Permeability: rapid
Drainage: somewhat excessively drained
Runoff: low
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: low
Hazard of water erosion: severe
Hazard of wind erosion: severe

Included with this soil in mapping are small areas of Coarsewood and Weswood soils. These soils are in higher positions on the landscape than those of the Gad soil. The included soils make up less than 25 percent of the map unit.

This soil is used for rangeland and pasture. It is not suited to cropland because of the hazard of flooding.

The areas used as rangeland are commonly invaded by cottonwood trees, prickly pear cactus, low growing annuals, and brush. This soil has the potential for growing tall and mid native grasses. Effective conservation practices include controlling undesirable species and seeding to suited rangeland grasses. Proper stocking and controlled grazing are essential to maintain desirable rangeland plants.

This soil is suited to improved bermudagrasses that help prevent soil loss during overflow and in many areas, accumulate sediments. Effective conservation practices include proper stocking rates, and weed and brush control. Because these soils are sandy, more than one application of fertilizer per growing season is desirable.

This soil has potential for wildlife habitat. Deer, doves, quail, songbirds, and furbearers inhabit the areas. Many of the forage plants for deer and birds are produced on this soil. Sites for resting, nesting, and escape cover are available in some areas.

This soil is not suited to urban or recreational uses because of the hazard of flooding and the sandy surface texture.

This soil is in capability subclass 5w and the Sandy Bottomland ecological site.

Ge—Ganado clay, occasionally flooded

This very deep, nearly level, clayey soil is on flood plains of major streams. The surface is smooth. Floods occur once every 2 to 15 years. Areas are elongated to oblong in shape. They range from 6 to 80 acres in size, averaging 40 acres. Slopes are 0 to 1 percent.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 12 inches, slightly alkaline, very dark gray clay

Subsoil:
12 to 25 inches, slightly alkaline, very dark gray clay

Figure 12.—An area of Gad fine sand, frequently flooded, along the Colorado River.

25 to 49 inches, slightly alkaline, very dark gray clay that has dark grayish brown mottles and common intersecting slickensides
49 to 67 inches, moderately alkaline, dark gray clay that has common intersecting slickensides

Underlying material:
67 to 80 inches, moderately alkaline, light gray sandy clay loam

Important soil properties—

Available water capacity: high
Permeability: very slow
Drainage: moderately well drained
Runoff: low
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: very high
Hazard of water erosion: slight
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Bosque and Pursley soils. The Bosque soil has a loamy texture and is higher on the landscape. The Pursley soil has a loamy texture and is adjacent to the stream channel. Also included are some areas of the Ganado soil that is frequently flooded. The included soils make up less than 20 percent of the map unit.

Most areas of this soil are used for cropland and pasture. A few acres are used for rangeland.

This soil is suited to corn, cotton, forage and grain sorghums, small grain crops, and pecan orchards. This soil has high natural fertility. When it is dry, deep, wide cracks form at the surface. When wet, the soil swells and the cracks close. Water ponds on the surface for a few hours following heavy rains. Early spring and late fall wetness and an occasional overflow during the crop growing season are the major limitations. Conservation practices are needed to maintain tilth and productivity.

Large acreages of this soil are used for pasture and hayland. Kleingrass and improved bermudagrasses are the main plants. Other adapted pasture plants include gordo bluestem, old world bluestem, johnsongrass, dallisgrass, white clover, and arrowleaf clover. Fertilization, weed control, and controlled grazing are essential for high production. The soil becomes compacted if grazed when wet.

Only a few acres of this soil are used for rangeland. The native vegetation is a mixture of tall and mid grasses and an overstory of oak, hackberry, elm, and pecan trees. Forage production can be increased in some areas by plowing and reseeding to adapted native rangeland plants.

This soil has potential for wildlife habitat. Areas are inhabited by doves, quail, squirrels, and deer. Several of the forbs and grasses provide seed for game birds and animals. A good selection of forbs for deer forage is available, but little cover and protection for escape and resting are provided.

This soil is not suited to urban uses. The limitations are the potential for shrinking and swelling, the hazard of flooding, low strength, high clay content, corrosivity to uncoated steel, and very slow permeability. Protection against cave-ins is needed when this soil is excavated.

This soil is not suited to recreational uses. The limitations are the hazard of flooding, very slow permeability, and high clay content.

This soil is in capability subclass 2w and the Clayey Bottomland ecological site.

Gf—Ganado clay, frequently flooded

This very deep, nearly level, clayey soil is on flood plains of major streams. Floods occur 5 or more times every 10 years. Floods are mainly of brief duration during the spring and fall months. Deep, wide cracks form in the soil when it is dry. During rainfall, water enters the cracks rapidly. When wet, the soil swells and the cracks close. Water then enters the soil very slowly. With continuous rainfall, water ponds on the surface and remains for a few hours following rains. The surface is smooth. Areas are oblong to elongated in shape. They range from 20 to more than 100 acres in size, averaging 60 acres. Slopes are 0 to 1 percent.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 31 inches, slightly alkaline, dark gray clay

Subsoil:
31 to 59 inches, moderately alkaline, dark gray clay
59 to 80 inches, moderately alkaline, grayish brown clay

Important soil properties—

Available water capacity: high
Permeability: very slow
Drainage: moderately well drained
Runoff: low
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: very high
Hazard of water erosion: slight
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Bosque and Pursley soils. The Bosque soil is occasionally flooded and is higher on the landscape. The Pursley soil is adjacent to stream channels. Also included are some areas of the Ganado soil that is occasionally flooded. The included soils make up less than 20 percent of the map unit.

This soil is used mainly for pasture and rangeland. Where flooding is less severe, a few acres are planted to corn and forage sorghum.

This soil is used for pasture plants, such as improved bermudagrasses, johnsongrass, gordo bluestem, white clover, sweetclover, and singletary peas. Fertilization, weed control, and controlled grazing are the conservation practices needed on this soil. Grazing when the soil is wet causes it to compact.

The native vegetation consists of a mixture of mid and tall grasses and an overstory of oak, hackberry, elm, and pecan trees. Forage production can be increased in some areas by plowing and reseeding to adapted native rangeland plants. Effective conservation practices include brush and weed control, proper stocking, and a controlled grazing system.

This soil is not suited to cultivation because of frequent flooding. However, areas protected from flooding can produce high yields of most crops planted in the area.

This soil has potential for wildlife habitat. Waterfowl, doves, quail, deer, squirrels, and furbearers inhabit the areas. Many forage plants are produced on this soil. Small grain crops produce winter grazing for deer. Nesting, resting, and escape cover is provided in nearby wooded areas. Shallow water areas or sloughs can be developed for waterfowl.

This soil is not suited to urban and recreational uses. The main limitation is the hazard of flooding. Protection against cave-ins is needed when this soil is excavated.

This soil is in capability subclass 5w and the Clayey Bottomland ecological site.

GhA—Gholson very fine sandy loam, 0 to 1 percent slopes

This very deep, nearly level, loamy soil is on terraces above the flood plain of the Colorado River. The surface is plane. Areas are subrounded to elongated in shape. They range from 10 to more than 80 acres in size, averaging 30 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 8 inches, neutral, brown very fine sandy loam

Subsurface layer:
8 to 14 inches, neutral, brown very fine sandy loam

Subsoil:
14 to 28 inches, neutral, red sandy clay loam
28 to 49 inches, slightly alkaline, reddish yellow loam
49 to 80 inches, moderately alkaline, reddish yellow fine sandy loam that has concretions and threads of calcium carbonate

Important soil properties—

Available water capacity: high
Permeability: moderate
Drainage: well drained
Runoff: low
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: low
Hazard of water erosion: slight
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Branyon, Dutek, and Smithville soils. The Branyon soil is in lower positions on the landscape. The Dutek soil is on low ridges and footslopes. The Smithville soil is in concave areas. The included soils make up 15 percent of the map unit.

This soil is used mainly for cropland and pasture. Sand and gravel are mined from underlying layers in some areas.

Small grain crops, corn, forage and grain sorghums, and peanuts are adapted to this soil. It is also suited to fruit orchards, vineyards, and truck crops. This soil is easily worked throughout a wide range of moisture conditions. Conservation practices, such as preventing soil blowing and maintaining tilth and fertility, can be achieved by growing cool-season legumes and leaving crop residue on or near the surface.

A variety of pasture plants are grown on this soil including improved bermudagrasses, weeping lovegrass, kleingrass, switchgrass, arrowleaf clover, and vetch. Effective conservation practices include controlling weeds, applying fertilizer with a complete fertilizer, and controlling grazing.

This soil has potential for wildlife habitat. Areas are inhabited by deer, doves, quail, and turkeys. Woody plants, forbs, and grasses provide good cover, browse, and seeds for game birds and animals. Small grain crops and other crop residue provide additional winter grazing for deer and turkeys as well as seed for doves and quail.

This soil is well suited to most urban uses. Limitations are moderate permeability and seepage, which affect septic tank absorption fields, sewage lagoons, and sanitary landfills.

This soil is well suited to most recreational uses.

This soil is in capability class 2e and the Sandy Loam ecological site.

GhB—Gholson very fine sandy loam, 1 to 3 percent slopes

This very deep, very gently sloping, loamy soil is on terraces of the Colorado River flood plain. The surface is plane to convex. Areas are irregular in shape. They range from 10 to more than 80 acres, averaging 60 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 7 inches, moderately acid, brown, very fine sandy loam

Subsurface layer:
7 to 13 inches, slightly acid, brown, very fine sandy loam

Subsoil:
13 to 25 inches, neutral, reddish brown clay loam
25 to 38 inches, neutral, yellowish red clay loam
38 to 56 inches, neutral, yellowish red loam
56 to 74 inches, slightly alkaline, reddish yellow loam that has soft masses of calcium carbonate
74 to 80 inches, slightly alkaline, reddish yellow fine sandy loam that has soft masses of calcium carbonate

Important soil properties—

Available water capacity: high
Permeability: moderate
Drainage: well drained
Runoff: medium
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: low
Hazard of water erosion: moderate
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Branyon, Dutek, and Smithville soils. The Branyon soil is in lower positions on the landscape. The Dutek soil is on low ridges and footslopes. The Smithville soil is in concave areas. The included soils make up as much as 15 percent of the map unit.

This soil is used mainly for pasture and cropland. Some areas are mined for the underlying sand and gravel.

Improved bermudagrasses, weeping lovegrass, kleingrass, switchgrass, vetch, and arrowleaf clover are adapted to this soil. Plant vigor and forage production can be maintained or increased by controlling weeds, using a complete fertilizer, and by controlling grazing.

This soil is suited to peanuts, small grain crops, corn, forage sorghum and grain sorghum, and melons. It is also suited to fruit and nut orchards, truck crops, vineyards, and nursery plants. Terraces and contour farming are needed on this soil to slow runoff and reduce water erosion. Crop residue, left on or near the surface, helps conserve moisture, control blowing, and maintain tilth. Strip cropping with rows at right angles to the prevailing wind direction helps reduce wind erosion and protects emerging seedlings from sand cutting.

A few acres of this soil are used for rangeland. The climax plant community consists of mid and tall grasses and an overstory of scattered oak.

This soil has potential for wildlife habitat. Areas are inhabited by deer, doves, quail, and turkeys. Woody plants, forbs, and grasses provide cover and nesting, browse, and seeds for game birds and animals.

This soil is suited to most urban uses. The main limitations are moderate permeability and seepage, which affect septic tank absorption fields, sewage lagoons, and sanitary landfills.

This soil is suited to most recreational uses.

This soil is in capability subclass 2e and the Sandy Loam ecological site.

GrB—Gredge fine sandy loam, 1 to 3 percent slopes

This very deep, gently sloping, loamy soil is on upland divides and side slopes. The surface is convex. Areas range from 15 to more than 500 acres in size, averaging 100 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:

0 to 6 inches, moderately acid, pale brown fine sandy loam

Subsoil:

6 to 16 inches, strongly acid, dark red sandy clay that has grayish brown and yellowish red mottles

16 to 24 inches, strongly acid, reddish brown sandy clay that has grayish and brownish mottles

24 to 34 inches, neutral, light yellowish brown and light brownish gray sandy clay loam

34 to 51 inches, slightly alkaline, reddish yellow sandy clay loam that has grayish mottles

Underlying material:

51 to 80 inches, slightly alkaline, brownish yellow fine sandy loam that has brownish yellow mottles and a few thin strata of brittle sandy material

Important soil properties—

Available water capacity: moderate
Permeability: very slow
Drainage: moderately well drained
Runoff: medium
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: low in surface; high in upper subsoil; moderate in lower subsoil
Hazard of water erosion: moderate
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Chazos, Edge, Zack, and Zulch soils. The sandy Chazos soil is in positions on the landscape slightly lower than those of the Gredge soil. The Edge soil is on steeper side slopes. The Zack soil is in similar positions and the Zulch soil is in lower positions. The included soils make up less than 20 percent of the map unit.

Most of this soil is used as rangeland and pasture. A few acres are used for cropland.

The native vegetation is a mixture of mid and tall grasses and scattered post oak and juniper trees. In many rangeland areas, oaks, juniper, and brush are predominant. Brush control is needed in many areas along with controlled grazing.

This soil is used mainly for pasture. Adapted pasture plants include improved bermudagrasses, kleingrass, weeping lovegrass, singletary peas, and arrowleaf clover. Effective conservation practices include fertilization, weed control, and controlled grazing to maintain adequate stubble height. Adding lime and a complete fertilizer increases forage production.

Some areas of this soil are used for cropland. Crops that mature during the cool seasons are best adapted because the amount of available moisture is often inadequate for crops to grow well in summer. Fertility is low and areas left bare are subject to erosion. Terracing and farming on the contour help slow runoff and reduce

water erosion. Leaving crop residue on the surface helps control soil blowing and conserve moisture. Growing cool-season legumes improves tilth and applying fertilizer helps reduce erosion.

This soil has potential for wildlife habitat. Deer, doves, quail, rabbits, and songbirds inhabit the areas. Forage plants are plentiful. Tall grasses provide nesting sites. Wooded areas provide cover and escape areas for deer.

This soil is moderately suited to most urban uses. Low strength, potential for shrinking and swelling with changes in moisture, and very slow permeability are the main limitations. Septic tank absorption fields are not suited to this soil because of the very slow permeability, clayey subsoil, and slope. These limitations can be partly overcome by good design and careful installation.

This soil is moderately suited to most recreational uses. The main limitation is very slow permeability.

This soil is in capability subclass 3s and the Claypan Savannah ecological site.

GvB—Greenvine clay, 1 to 3 percent slopes

This moderately deep, very gently sloping, clayey soil is on interstream divides and side slopes. In undisturbed areas, surfaces are characterized by gilgai microrelief consisting of microknolls and microdepressions. Areas are subrounded to elongated. They range from 6 to about 275 acres in size, averaging about 80 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 14 inches, slightly alkaline, very dark gray clay

Subsoil:
14 to 29 inches, slightly alkaline, dark gray clay that has common grooved intersecting slickensides
29 to 39 inches, slightly alkaline, gray clay that has common large intersecting slickensides

Underlying material:
39 to 60 inches, moderately alkaline, white tuff

Important soil properties—

Available water capacity: low
Permeability: very slow
Drainage: moderately well drained
Runoff: medium
Water table: none within a depth of 6 feet
Root zone: moderately deep
Shrink-swell potential: very high
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Arol and Flatonia soils. These soils have a loamy surface layer and are in positions on the landscape similar to those of the Greenvine soil. Also included is a soil similar to the Greenvine soil, except it is more than 40 inches deep. The included soils make up as much as 15 percent of the map unit.

This soil is used for pasture and rangeland. A few acres are used for cropland.

This soil is suited to pasture plants, such as improved bermudagrasses, gordo bluestem, old world bluestem, switchgrass, kleingrass, sweetclover, and vetch. Effective conservation practices include fertilization, weed control, and controlled grazing.

Many areas of this soil are used for rangeland. The native vegetation is a mid and tall grass prairie. Tall grasses grow well where grazing is well managed. Mesquite and oak trees have invaded a few areas that have been continually close grazed.

This soil is suited to small grain crops, forage and grain sorghums, and corn. It forms wide cracks when dry and is difficult to work during extremes in moisture content. Planting crops that produce a large amount of residue and leaving it on or near the surface help reduce erosion and maintain tilth. Deep-rooted legumes help aerate the soil and improve fertility. Conservation practices that reduce erosion and maintain soil tilth are needed.

This soil has potential for wildlife habitat. Areas are inhabited by doves, quail, and small furbearers. Forbs and grasses provide food and cover for game birds and animals, including deer. Crops and their residue provide additional food.

This soil is poorly suited to most urban uses. The potential for shrinking and swelling with changes in moisture, very slow permeability, depth to bedrock, clayey subsoil, low strength, and corrosivity to uncoated steel are the main limitations. Protection against cave-ins is needed when this soil is excavated. These limitations can be partly overcome by using good design and careful installation.

This soil is moderately suited to most recreational uses. The main limitations are very slow permeability and the clay surface layer that forms deep, wide cracks when the soil is dry and is sticky when wet.

This soil is in capability subclass 2e and the Blackland ecological site.

GvC—Greenvine clay, 3 to 5 percent slopes

This moderately deep, gently sloping, clayey soil is on upland side slopes. Uncultivated areas have gilgai microrelief consisting of highs and lows that are parallel, and are oriented up and down slopes. Areas are elongated and follow the contour of slopes. They range from 10 to more than 50 acres in size, averaging 40 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 13 inches, slightly alkaline, very dark gray clay
13 to 21 inches, slightly alkaline, dark gray clay

Subsoil:
21 to 30 inches, slightly alkaline, gray clay that has common intersecting slickensides

Underlying material:
30 to 60 inches, moderately alkaline, white and light gray tuff and chalky material

Important soil properties—

Available water capacity: low
Permeability: very slow
Drainage: moderately well drained
Runoff: high
Water table: none within a depth of 6 feet
Root zone: moderately deep
Shrink-swell potential: very high
Hazard of water erosion: severe
Hazard of wind erosion: slight

Included with this soil in mapping are areas of Arol, Flatonia, and Shalba soils. The Arol and Flatonia soils are less sloping and higher on the landscape. The Shalba soil has a loamy surface and is in positions similar to or higher than those of the Greenvine soil. The included soils make up less than 15 percent of the map unit.

This soil is mainly used for pasture and rangeland. A few acres are used for cropland.

Pasture plants adapted to this soil include improved bermudagrasses, kleingrass, gordo bluestem, old world bluestem, johnsongrass, sweetclover, vetch, and white clover. Conservation practices needed to improve production and maintain forage vigor are fertilization, weed control, and controlled grazing.

The native vegetation is a mixture of tall and mid grasses and a scattering of elm, hackberry, and oak trees. Continuous overgrazing has caused brush and trees to increase. Some previously cultivated areas can be improved by destroying brush, preparing a seedbed, and seeding to suited rangeland forage plants. Controlled grazing is essential to maintain grass vigor and high forage production.

This soil is suited to small grain crops, corn, forage sorghum, and grain sorghum. Cotton is also suited to this soil. Conservation practices are needed that reduce erosion and maintain tilth. Terracing and farming on the contour help slow runoff and reduce erosion. Growing deep-rooted legumes helps maintain tilth. Leaving crop residue on or near the surface helps conserve moisture, slow runoff, and lower soil temperature.

This soil has potential for wildlife habitat. Deer and doves inhabit the areas. Food and cover plants are limited for deer; however, oak trees are abundant in some areas. Disturbing the soil in a strip pattern can increase annual weeds for food production.

The soil is poorly suited to most urban uses. The main limitations are the potential for shrinking and swelling with changes in moisture, very slow permeability, depth to bedrock, clayey subsoil, corrosivity to uncoated steel, and low strength. Protection against cave-ins is needed when this soil is excavated.

This soil is moderately suited to most recreational uses. The main limitations are slope, very slow permeability, and the clayey surface layer that forms wide cracks when dry and is sticky when wet.

This soil is in capability subclass 3e and the Blackland ecological site.

GvD4—Greenvine-Gullied land complex, 3 to 8 percent slopes

This map unit consists of moderately deep, gently sloping and moderately sloping, clayey soils and gullied land on uplands. The surface is convex. Vertical-walled gullies, 6 to 40 feet wide, and 2 to 12 feet deep, dissect the area at intervals of 40 to 200 feet. These gullies cut into the soft tuffaceous bedrock. About 20 to 50 percent of the areas are composed of gullies, averaging about 35 percent. In some areas of Greenvine soil, sheet erosion has removed a large part of the surface layer. Areas are irregular in shape. They range from 15 to 100 acres in size, averaging 40 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 8 inches, slightly alkaline, dark gray clay

Subsoil:
8 to 29 inches, slightly alkaline, grayish brown clay

Underlying material:
29 to 48 inches, moderately alkaline, white tuff interbedded with light gray and grayish brown

loamy material containing many concretions of calcium carbonate

Important soil properties—

Available water capacity: low
Permeability: very slow
Drainage: moderately well drained
Runoff: very high
Water table: none within a depth of 6 feet
Root zone: moderately deep
Shrink-swell potential: very high
Hazard of water erosion: severe
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of gullied Arol, Flatonia, and Singleton soils. Erosion has removed most of the surface layer from these soils. They make up less than 25 percent of the map unit.

The soils of this map unit are used mainly for rangeland and wildlife habitat. The deep gullies are unsuitable for pasture or cropland.

The less eroded areas where grazing is controlled are suited for growing mid and tall native grasses. Annuals, poor quality perennials, brush, and oaks have replaced the desirable grasses in areas where the grazing has been long and continuous. As the grass cover thins, runoff increases and the gullies increase in width and length. To reduce erosion, brush should be controlled and areas fenced to allow native grasses to regain their vigor and increase. Grazing should be controlled and limited.

This soil has potential for wildlife habitat. Areas produce forbs and annual grasses that are used by deer, quail, doves, and other wildlife. Controlling juniper and other brush increases the food supply and helps reduce erosion.

These soils are poorly suited to urban and recreational uses. Deep gullies, severe hazard of erosion, the potential for shrinking and swelling with changes in moisture, and slope are the main limitations.

This map unit is in capability subclass 6e and the Eroded Blackland ecological site.

HvB—Hallettsville fine sandy loam, 1 to 3 percent slopes

This very deep, very gently sloping, loamy soil is on footslopes and upland stream divides. The surface is mainly plane to convex, but some areas are weakly concave. Areas are oblong to oval in shape. They range from 15 to more than 60 acres in size, averaging 40 acres

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 8 inches, moderately acid, dark grayish brown fine sandy loam

Subsoil:
8 to 20 inches, slightly acid, very dark gray sandy clay
20 to 35 inches, slightly alkaline, grayish brown clay that has a few fine dark yellowish brown mottles
35 to 41 inches, slightly alkaline, grayish brown clay loam that has common concretions of calcium carbonate
41 to 53 inches, slightly alkaline, pale brown clay loam that has common threads, soft masses, and concretions of calcium carbonate
53 to 62 inches, moderately alkaline, light yellowish brown sandy clay loam

Underlying material:
62 to 80 inches, moderately alkaline, pale brown and light gray clay loam that is stratified with thin strata of shale

Important soil properties—

Available water capacity: moderate
Permeability: very slow
Drainage: moderately well drained
Runoff: medium
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: high
Hazard of water erosion: moderate
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Carbengle, Frelsburg, and Straber soils. The loamy Carbengle soil is in positions on the landscape higher than those of the Hallettsville soil. The clayey Frelsburg soil and the sandy Straber soil are in similar positions. Also included are loamy alluvial soils on narrow flood plains. The included soils make up about 15 percent of the map unit.

This soil is used for cropland, pasture, and rangeland. Small grain crops, corn, and forage and grain sorghums are the main crops. Cotton is also grown. This soil has moderate to high natural fertility and can be worked over a wide range of moisture conditions. The main conservation practices that help reduce erosion and maintain productivity and tilth are leaving crop residue on the surface and growing cover crops. Terraces are needed to slow runoff and divert the excess runoff to protected drainageways that are in perennial vegetation. Fertilizer containing nitrogen, phosphate, and potash increases yields.

Forage plants suited for pastures include improved bermudagrasses, old world bluestem, weeping lovegrass, kleingrass, arrowleaf clover, and vetch. Fertilizer, weed control, and controlled grazing are needed for maximum forage production.

Rangeland vegetation is a savannah with scattered live oak and post oak trees and grasses, such as bluestem, grama, paspalum, and panicum. Yields can be increased by controlling brush, reseeding, and using controlled grazing.

Areas of this soil produce large motts of live oak and post oak trees as well as a wide variety of grasses and forbs, along with some invading brush, such as yaupon, huisache, and mesquite. This vegetation provides the habitat and food supply for deer, doves, quail, songbirds, and squirrels.

This soil is poorly suited to most urban uses. The main limitations are very slow permeability, potential for shrinking and swelling with changes in moisture, clayey subsoil, and corrosivity to uncoated steel. These limitations can be partly overcome by good design and careful installation.

This soil is moderately suited to most recreational uses. The main limitation is very slow permeability.

This soil is in capability subclass 2e and the Claypan Prairie ecological site.

IzA—Inez fine sandy loam, 0 to 1 percent slopes

This very deep, nearly level, loamy soil is on low stream terraces. The surface is plane. Areas are oblong to elongated in shape. They range from 10 to more than 50 acres in size, averaging 30 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 7 inches, moderately acid, light brownish gray fine sandy loam

Subsurface layer:
7 to 17 inches, moderately acid, very pale brown fine sandy loam

Subsoil:
17 to 27 inches, moderately acid, grayish brown clay that has yellowish brown mottles
27 to 38 inches, slightly acid, light brownish gray clay that has yellowish brown and very dark gray mottles
38 to 49 inches, neutral, mottled grayish brown, light grayish brown and yellowish brown sandy clay
49 to 60 inches, slightly alkaline, light brownish gray sandy clay
60 to 80 inches, slightly alkaline, light gray sandy clay loam

Important soil properties—

Available water capacity: moderate
Permeability: very slow
Drainage: moderately well drained
Runoff: slow
Water table: none within a depth of 6 feet; however, the surface is saturated for brief periods after heavy rains
Root zone: very deep
Shrink-swell potential: low in surface layer, high in subsoil
Hazard of water erosion: slight
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Lufkin, Uhland, and Zulch soils. The Lufkin and Zulch soils are in slight depressional areas or are lower on the landscape. The Uhland soil is along streams or on flood plains. The included soils make up less than 15 percent of the map unit.

This soil is used mainly for pasture. A few acres are used for cropland and rangeland. Improved bermudagrasses and bahiagrass are the most adapted pasture plants. Fertilizer, weed control, and controlled grazing are necessary for maximum hay and pasture production.

A few acres of this soil are planted to forage sorghum and small grain crops. Corn, cotton, and peanuts were previously planted. When it rains for long periods, a perched water table is above the clayey subsoil and extends to the surface in depressional areas. The surface tends to crust when dry. Applications of lime are needed to neutralize the acidic nature of this soil. Leaving crop residue on or near the surface can help maintain tilth and fertility.

Rangeland vegetation is a mixture of tall and mid grasses and an overstory of oak trees. Yaupon and juniper commonly invade and increase. Effective conservation practices include brush control and controlled grazing.

This soil has potential for wildlife habitat. Areas are inhabited by deer, doves, quail, squirrels, and turkeys. Controlling brush in strips or patterns enhances the habitat for all forms of wildlife. An occasional field of small grain provides winter food for deer and turkeys. Tall grass makes an adequate nesting site for turkeys.

This soil is poorly suited to most urban uses. The main limitations are very slow permeability, high corrosivity to steel, and potential for shrinking and

swelling of the clayey subsoil with changes in the moisture content. These limitations can be partly overcome by good design and careful installation.

This soil is poorly suited to most recreational uses. The main limitation is very slow permeability.

This soil is in capability subclass 2w and the Sandy Loam ecological site.

JoC—Joiner sand, 2 to 5 percent slopes

This very deep, gently sloping, sandy soil is on upland stream divides, low ridges, and side slopes. The surface is convex. Areas are elongated to oval in shape. They range from 30 to more than 300 acres in size, averaging 120 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 12 inches, moderately acid, grayish brown sand

Subsurface layer:
12 to 38 inches, moderately acid, very pale brown sand
38 to 45 inches, moderately acid, white sand

Subsoil:
45 to 50 inches, moderately acid, white loamy sand
50 to 55 inches, very strongly acid, brownish yellow loamy sand
55 to 65 inches, strongly acid, reddish yellow loamy sand
65 to 80 inches, strongly acid, strong brown loamy sand

Important soil properties—

Available water capacity: low
Permeability: rapid
Drainage: somewhat excessively drained
Runoff: very low
Water table: at a depth of 3.5 to 5.0 feet, apparent, October to February
Root zone: very deep
Shrink-swell potential: low
Hazard of water erosion: slight
Hazard of wind erosion: severe

Included with this soil in mapping are small areas of Lufkin, Straber, Tremona, and Wilson soils. The Lufkin soil is in concave areas. The Straber and Tremona soils are in positions on the landscape similar to those of the Joiner soil, except their sandy surface layer is less than 40 inches thick. The Wilson soil is in nearly level areas. The included soils make up less than 15 percent of the map unit.

This soil is used for rangeland and pasture. Areas used as rangeland generally have a thick canopy of oak trees and scattered hickory trees. The thick, woody vegetation has shaded out most of the mid and tall native grasses. Effective conservation practices include controlling brush, reseeding to suited native range plants, and controlling grazing to maintain adequate stubble height. Improved bermudagrasses is an adapted pasture plant. Other adapted plants include weeping lovegrass, vetch, and bahiagrass. Forage production can be maintained or improved by using weed control, proper stocking, and applications of a complete fertilizer. The fertilizer applications should be split and applied at planned intervals throughout the growing season. Lime is needed in some areas.

This soil is suited to watermelons, corn, peanuts, and peas. Areas used for cropland need protection from soil blowing. Crop residue left on the surface helps reduce erosion, maintain tilth, and reduce soil temperature.

This soil has potential for wildlife habitat. Deer and squirrels are the main wildlife. Deer use the thick, brushy areas for escape and resting. Controlling brush in patterns or strips increases wildlife food and maintains cover.

This soil is suited to most urban uses. It is not suited to septic tank absorption fields because of the sandy texture that is a poor filter of effluent. Protection against cave-ins is needed when this soil is excavated.

This soil is not suited to most recreational uses because of the sandy surface layer.

This soil is in capability subclass 3s and the Deep Sand ecological site.

KnC—Knolle fine sand, 2 to 5 percent slopes

This very deep, gently sloping, sandy soil is on uplands. The surface is convex. Areas are irregular in shape. They range from 7 to more than 60 acres in size, averaging 40 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 13 inches, slightly acid, brown fine sand

Subsoil:
13 to 20 inches, strongly acid, dark brown sandy loam that has common dark red and brown mottles
20 to 35 inches, strongly acid, yellowish red sandy clay that has common dark red mottles

35 to 55 inches, strongly acid, yellowish red sandy clay loam

Underlying material:
55 to 80 inches, strongly acid, strong brown sandy loam

Important soil properties—

Available water capacity: moderate
Permeability: moderate
Drainage: well drained
Runoff: low
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: low
Hazard of water erosion: moderate
Hazard of wind erosion: severe

Included with this soil in mapping are small areas of Brenham, Dubina, and Straber soils. The Brenham soil is on side slopes. The Dubina and Straber soils are in positions on the landscape lower than those of the Knolle soil. The included soils make up less than 15 percent of the map unit.

This soil is used for pasture, cropland, and rangeland.

This soil is suited to pasture. Improved bermudagrasses, weeping lovegrass, switchgrass, arrowleaf clover, vetch, and bahiagrass are adapted pasture plants. A firm seedbed and late grass seedlings are difficult to establish because of loose sand that blows. A complete fertilizer and weed control are needed for sustained forage production. Controlled grazing is needed to maintain adequate stubble height.

This soil is suited to corn, small grain crops, and sorghums. It is suited to growing peanuts, grapes, melons, and other truck crops. Fruit orchards are also grown. This soil absorbs moisture readily, is well drained, and is easy to work throughout a wide range of moisture conditions. The amount of available moisture is often inadequate for crops to grow well in summer. In many areas, adding lime helps overcome acidic conditions. This soil is susceptible to severe wind erosion if the surface is left bare. Leaving crop residue on the surface helps maintain the organic matter content and reduces soil blowing. Growing cool-season legumes also helps increase tilth and reduce erosion.

Rangeland areas that are not re-seeded to native grasses consist of poorly palatable grasses and weeds. Bullnettle and prickly pear cactus have invaded some areas. The soil is suited to mid and tall native grasses. Some areas can be improved by seeding desirable native plants into a well prepared, firm seedbed. Controlled grazing is needed to help grasses maintain their vigor.

This soil has potential for wildlife habitat. Areas are inhabited by songbirds, upland game birds, small mammals, and deer. Crop residue and winter cover crops provide additional forage for deer and game birds. Cover is sparse for protection and rest, as most areas are cleared of woody vegetation.

The soil is moderately suited to most urban uses. The main limitations are seepage and corrosivity to uncoated steel and concrete.

This soil is poorly suited to most recreational uses because of the sandy surface layer.

This soil is in capability subclass 3e and the Loamy Sand ecological site.

KoC—Koether loamy fine sand, 2 to 5 percent slopes, stony

This shallow, gently sloping, sandy soil is on uplands underlain by strongly cemented tuffaceous sandstone. Some cobbles and stones of coarse grained sandstone are on the surface, but most are buried. The surface is convex. Areas are elongated to irregular in shape. They range from 7 to more than 50 acres in size, averaging 30 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 14 inches, strongly acid, pale brown, loamy fine sand that has 50 percent cobbles and stones

Underlying material:
14 to 20 inches, white strongly cemented tuffaceous sandstone that has few fractures in the upper part

Important soil properties—

Available water capacity: very low
Permeability: rapid
Drainage: somewhat excessively drained
Runoff: high
Water table: none within a depth of 6 feet
Root zone: shallow
Shrink-swell potential: low
Hazard of water erosion: moderate
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Burlewash and Shalba soils. Also included are a few areas of rock outcrop. The Burlewash and Shalba soils are in lower positions on the landscape. The included soils make up less than 20 percent of the map unit.

This soil is used for rangeland. A few acres have long or oblong pits from which sandstone was quarried. Areas have mid and tall grasses and scattered oak trees. Yaupon and other woody plants have invaded a few areas. Root depth and available moisture are limited by the amount and depth of fractures in the sandstone bedrock.

This soil has very little potential for wildlife habitat; however, some of the brushy areas are inhabited by deer, doves, and quail.

This soil is not suited to urban or recreational uses because of depth to bedrock and large stones on the surface.

This soil is in capability subclass 7s and the Sandstone Hills ecological site.

Kr—Krum silty clay, rarely flooded

This very deep, nearly level, clayey soil is on low stream terraces of the Colorado River. The soil is protected from most flooding by large upstream structures; however, flooding has occurred, and most areas are susceptible during extreme conditions. The surface is smooth. Areas are elongated to oval in shape. They range from 25 to more than 125 acres in size, averaging 50 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 7 inches, moderately alkaline, brown silty clay

Subsurface layer:
7 to 12 inches, moderately alkaline, dark brown silty clay
12 to 26 inches, moderately alkaline, brown silty clay

Subsoil:
26 to 65 inches, moderately alkaline, reddish brown silty clay

Underlying material:
65 to 80 inches, moderately alkaline, light reddish brown silty clay that contains concretions of calcium carbonate

Important soil properties—

Available water capacity: high
Permeability: moderately slow
Drainage: well drained
Runoff: low
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: high
Hazard of water erosion: slight
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Bergstrom and Ships soils. The Bergstrom soil is on high ridges. The Ships soil is in slightly concave and depressional areas. The included soils make up less than 15 percent of the map unit.

This soil is mainly cultivated. A few acres are used for pasture and hay. Adapted crops are corn, forage and grain sorghums, and alfalfa. A few acres are planted to pecan trees. Cotton, small grain crops, and some varieties of soybeans are also adapted. Allowing the soil to dry before cultivation and harvesting helps maintain structure. Growing deep-rooted legumes and leaving crop residue on or near the surface helps maintain soil tilth and fertility and lowers the soil temperature.

The native vegetation was a mid and tall grass prairie. Improved bermudagrasses, kleingrass, gordo bluestem, old world bluestem, johnsongrass, sweetclover, white clover, and vetch are adapted to this soil. Forage vigor and production is maintained or increased by controlling weeds, controlling grazing, and applying fertilizer. Scattered trees included oak, elm, ash, hackberry, and pecan.

This soil has potential for wildlife habitat. Areas are inhabited by deer and doves. Cover is limited; however, grain crops provide abundant food sources. Tall grass areas make adequate nesting sites for turkeys.

This soil is poorly suited to most urban uses. The main limitations are the potential for shrinking and swelling with changes in moisture, slow percolation that affects septic tank absorption fields, low strength that affects streets and roads, and the hazard of flooding.

This soil is moderately suited to most recreational uses. The main limitations are the hazard of flooding and the clayey surface layer.

This soil is in capability subclass 2s and the Clay Loam ecological site.

KuC—Kurten very fine sandy loam, 2 to 5 percent slopes

This deep, gently sloping, loamy soil is on convex ridges and side slopes of ridges. Areas are subrounded to elongated in shape. They range from 15 to about 250 acres in size, averaging 100 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 7 inches, strongly acid, pale brown very fine sandy loam

Subsoil:
7 to 19 inches, very strongly acid, red clay that has few dark grayish brown and pale brown mottles
19 to 32 inches, very strongly acid, yellowish red clay that has common yellowish brown mottles
32 to 48 inches, slightly acid, reddish brown clay loam that has common yellowish red mottles

Underlying material:
48 to 60 inches, slightly alkaline, mottled light gray and yellow clay loam that contains thin strata of iron enriched material
60 to 80 inches, slightly alkaline, mottled white and light gray clay loam that has olive yellow mottles

Important soil properties—

Available water capacity: high
Permeability: very slow
Drainage: well drained
Runoff: medium
Water table: none within a depth of 6 feet
Root zone: deep
Shrink-swell potential: low in surface layer, high in subsoil
Hazard of water erosion: moderate
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Chazos, Crockett, Denhawken, and Elmendorf soils. The Chazos soil is lower on the landscape. The Crockett soil is in positions on the landscape similar to those of the Kurten soil. The Elmendorf and Denhawken soils are on footslopes and are generally lower on the landscape than the Kurten soil. A few scattered gullies are in some areas. The included soils make up less than 20 percent of the map unit.

This soil is used mainly for rangeland and pasture. A few acres are used for cropland.

In well managed areas of rangeland, the climax vegetation is a savannah of mid and tall grasses and an overstory of post oak and blackjack oak trees. The range deteriorates where the overstory of oaks and understory of shrubs and vines are dense. Effective conservation practices include brush control, reseeding, and proper stocking and planned grazing.

This soil is suited to pasture. Suitable pasture plants include improved bermudagrasses, weeping lovegrass, kleingrass, switchgrass, old world bluestem, vetch, and arrowleaf clover. Effective conservation practices include weed control and controlled grazing to maintain adequate stubble height. Grass production is increased by applications of lime and a complete fertilizer.

A few acres of this soil are used for cropland. It has limited use because of low natural fertility, a moderate hazard of erosion, and the droughty nature of the clayey subsoil. The surface layer tends to crust when dry. Effective conservation practices include controlling wind and water erosion, conserving moisture, and improving tilth and fertility. Terracing and farming on the contour help slow runoff and reduce water erosion. Leaving crop residue on the surface helps reduce soil blowing, conserves moisture, and keeps the surface porous. Growing cool-season legumes improves tilth and fertility and reduces erosion.

This soil has potential for wildlife habitat. Doves, quail, deer, and songbirds inhabit the areas. Controlling brush in strips or patterns increases the food supply and allows cover for wildlife. Overgrazing reduces palatable forbs used for food.

This soil is poorly suited to most urban uses. The main limitations are the potential for shrinking and swelling with changes in moisture, corrosivity to uncoated steel and concrete, low strength, very slow permeability, and the clayey subsoil. These limitations can be partly overcome by good design and careful installation.

This soil is moderately suited to recreational uses. The main limitation is very slow permeability.

This soil is in capability subclass 4e and the Claypan Savannah ecological site.

LaD—Latium clay, 3 to 8 percent slopes

This very deep, gently sloping and moderately sloping clayey soil is along slope breaks on uplands. The surface is convex. Areas are elongated and follow contours of the landscape. They range from 5 to more than 200 acres in size, averaging 60 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 8 inches, moderately alkaline, dark grayish brown clay

Subsoil:
8 to 16 inches, moderately alkaline, light olive brown clay that has common intersecting slickensides
16 to 35 inches, moderately alkaline, light olive brown clay that has common intersecting slickensides and grayish brown and yellowish brown mottles
35 to 60 inches, moderately alkaline, mottled light yellowish brown and light olive brown clay that has common intersecting slickensides
60 to 80 inches, moderately alkaline, light yellowish brown clay that has few intersecting slickensides

and light brownish gray and yellowish brown mottles

Important soil properties—

Available water capacity: high
Permeability: very slow
Drainage: well drained
Runoff: high
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: very high
Hazard of water erosion: severe
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Brenham, Carbengle, and Frelsburg soils. The loamy Brenham and Carbengle soils are on side slopes. The Frelsburg soil is generally higher on the landscape. Also included are a few gullies about 6 feet deep along field boundaries and drainageways. The included soils make up less than 20 percent of the map unit.

This soil is used mainly for pasture and rangeland. A few acres are used for cropland.

This soil is suited to pasture plants, such as improved bermudagrasses, old world bluestem, gordo bluestem, and kleingrass. Effective conservation practices include fertilization, weed control, and controlled grazing.

Native rangeland consists of tall and mid native grasses and a few scattered trees. Effective conservation practices include proper stocking and planned grazing to help maintain plant vigor. In some areas, reseeding adapted native grass plants into a prepared seedbed increases palatable forage production. In some areas, active erosion needs to be controlled.

Corn, forage sorghum, grain sorghum, and small grain crops are adapted to this soil, although the total cultivated acres are small. The severe hazard of erosion, rapid runoff, and lowered natural fertility from past erosion limit crop yields. Crop residue left on the surface from conservation tillage operations helps maintain organic matter content and reduce erosion. Terraces, grassed waterways, and contour farming also help slow runoff and erosion.

This soil has potential for wildlife habitat. Coyotes, rabbits, quail, doves, and deer from nearby wooded areas use the areas for food and cover. Overgrazing reduces forage for wildlife.

This soil is poorly suited to most urban uses. The main limitations are the potential for shrinking and swelling with changes in soil moisture, very slow permeability, and low strength that affects roads and streets. Protection against cave-ins is needed when this soil is excavated.

This soil is moderately suited to most recreational uses. The clayey surface layer and slope are the main limitations.

This soil is in capability subclass 4e and the Blackland ecological site.

LaD3—Latium clay, 5 to 15 percent slopes, severely eroded

This very deep, strongly sloping and moderately steep, clayey soil is on side slopes above flood plains and drainageways. Some areas have microrelief of narrow ridges and valleys that extend up and down the slope. Except in the moderately steep areas, most of this soil has been cultivated and damaged by sheet and gully erosion. On upper slopes, sheet erosion has removed most of the surface layer. Gullies 10 to 50 feet wide, 1 to 5 feet deep, and 50 to 300 feet apart cut through the areas; however, most have now been shaped and smoothed. The shaping has further reduced the thickness of the surface layer and has exposed the less fertile subsoil. A few gullies are not crossable with farm machinery. Areas are convex and follow the contour of the landform. They range from 5 to more than 200 acres in size, averaging 100 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 6 inches, moderately alkaline, dark gray clay

Subsoil:
6 to 12 inches, moderately alkaline, light olive brown clay that has common masses of calcium carbonate
12 to 26 inches, moderately alkaline, light olive brown clay that has olive yellow mottles and common masses of calcium carbonate
26 to 50 inches, moderately alkaline, grayish brown clay that has light olive brown mottles and common pressure faces and slickensides
50 to 65 inches, moderately alkaline, olive yellow clay that has light gray mottles and pressure faces

Important soil properties—

Available water capacity: high
Permeability: very slow
Drainage: well drained
Runoff: very high
Water table: none within a depth of 6 feet

Root zone: very deep
Shrink-swell potential: very high
Hazard of water erosion: severe
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of less than 5 acres of eroded Brenham, Carbengle, Frelsburg, Renish, and gravelly Latium soils. Also included are small areas of the Latium soil on lower slopes and on steeper, uncultivated slopes that are either not eroded or only slightly eroded. The included soils make up less than 20 percent of the map unit.

This soil is used for pasture and rangeland. It is not suited to cropland because of slope and the severe hazard of erosion.

Some of the less sloping areas of this soil are suited to pasture plants, such as improved bermudagrasses, kleingrass, gordo bluestem, old world bluestem, johnsongrass, and clover. Plant vigor can be maintained or improved by controlling weeds, fertilizing, and using planned grazing practices.

Native vegetation is mid and tall grasses and a few scattered trees. In many areas, native vegetation is inadequate because quality range vegetation was not established after cultivation ended. Mesquite and huisache are invading some areas. Effective conservation practices include shaping gully banks, diverting overhead water, preparing seedbeds, controlling brush, reseeding to proper native vegetation, and using planned grazing practices.

This soil has potential for wildlife habitat. Coyotes, rabbits, doves, and quail use the areas. Deer from nearby wooded areas browse in this habitat. Overgrazing reduces habitat and food supply for wildlife.

This soil is poorly suited to urban uses. Cuts made across the slope can cause soil slippage. The main limitations are the potential for shrinking and swelling with changes in moisture, low strength that affects streets and roads, and slope. Protection against cave-ins is needed when this soil is excavated.

Recreation is limited by very slow permeability, slope, and the clayey surface that cracks when dry and is sticky when wet.

This soil is in capability subclass 6e and the Eroded Blackland ecological site.

LgD—Latium gravelly clay, 5 to 12 percent slopes

This very deep, strongly sloping, gravelly soil is on hillsides. Some areas are wooded and dissected by many drainageways, many of which are gullied. Rounded siliceous gravels and a few cobbles are on the surface and imbedded in the surface layer. The gravels and cobbles make up about 15 to 35 percent of the surface layer. The surface is convex. Areas are elongated in shape. They range from 10 to 40 acres in size, averaging 20 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 10 inches, moderately alkaline, very dark gray gravelly clay

Subsoil:
10 to 22 inches, moderately alkaline, grayish brown gravelly clay that has black stains
22 to 32 inches, moderately alkaline, brown clay that has a few siliceous pebbles
32 to 44 inches, moderately alkaline, light gray clay that has yellowish mottles and common soft masses of calcium carbonate
44 to 60 inches, moderately alkaline, light gray clay that has yellowish mottles and many soft masses of calcium carbonate

Important soil properties—

Available water capacity: high
Permeability: very slow
Drainage: well drained
Runoff: very high
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: very high
Hazard of water erosion: severe
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Brenham, Frelsburg, and Carbengle soils. The loamy Brenham and Carbengle soils are on side slopes. The Frelsburg soil is generally higher on the landscape. Some scattered areas of these soils and Latium soil contain little gravel, and some areas contain large amounts of gravels and cobbles on or in the surface layer. The included soils make up less than 30 percent of the map unit.

This soil is used for rangeland and pasture. It is not used for cropland because of the gravelly surface layer, the severe hazard of water erosion, and many drainageways.

Most rangeland areas contain a ground cover of mid and tall grasses and scattered juniper and live oak

trees. Effective conservation practices include brush control and controlled grazing. Some eroded areas can be improved by shaping gully banks and reseeding to native range plants.

A few areas of this soil are suited to improved bermudagrasses, kleingrass, and old world bluestem. Other suited plants are sweetclover, arrowleaf clover, and vetch. Applications of fertilizer, weed control, and controlled grazing are essential to maintain plant vigor and increase forage production.

This soil has potential for wildlife habitat. This habitat provides browse and food for deer, quail, doves, and turkeys. It produces tall grasses that make suitable nesting sites for turkeys. Overgrazing causes invasion of brush, a decline in quality plants, and reduction in food supply.

This soil is not suited to most urban uses. The main limitations are slope, the clayey and gravelly surface, very slow permeability, potential for shrinking and swelling with changes in moisture, and low strength. Deep cuts made across the slope cause the banks to cave and the soil to creep and slip. Protection against cave-ins is needed when this soil is excavated.

This soil is moderately suited to most recreational uses. The slope, clayey surface, and very slow permeability are the main limitations.

This soil is in capability subclass 6e and the Blackland ecological site.

LkA—Lufkin fine sandy loam, 0 to 2 percent slopes

This very deep, nearly level to very gently sloping, loamy soil is in broad areas on uplands. The surface is plane. Areas are irregular to oblong in shape. They range from 15 to more than 60 acres in size, averaging 30 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 3 inches, slightly acid, brown fine sandy loam

Subsurface layer:
3 to 7 inches, moderately acid, light gray fine sandy loam

Subsoil:
7 to 20 inches, very strongly acid, grayish brown clay that has yellowish brown mottles
20 to 43 inches, moderately acid, gray clay
43 to 66 inches, slightly alkaline, light gray clay loam

Underlying material:
66 to 80 inches, slightly alkaline, white sandy clay loam

Important soil properties—

Available water capacity: medium
Permeability: very slow
Drainage: moderately well drained
Runoff: low
Water table: none within a depth of 6 feet; however, the surface is saturated for brief periods following heavy rains
Root zone: very deep
Shrink-swell potential: very high
Hazard of water erosion: slight
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Chazos, Gredge, and Zulch soils. The Chazos and Gredge soils are on slopes or slightly higher on the landscape. The Zulch soil is in positions on the landscape similar to those of the Lufkin soil. Also included is a soil similar to the Lufkin soil, except the subsoil is darker in color and is more alkaline. The included soils make up less than 15 percent of the map unit.

This soil is used mainly for pasture and rangeland. Only a few acres are planted to crops.

This soil is suited to pasture plants, such as improved bermudagrasses, bahiagrass, crimson clover, and vetch. Forage production is increased by fertilization, weed control, and controlled grazing. Lime is needed to help overcome acid soil conditions and to help increase the effectiveness of fertilizer.

Areas used for rangeland have an overstory of oak and juniper trees and an understory of bluestem, dropseed, threeawn, panicum, paspalum, and purpletop. Continuous grazing has caused woody vegetation to increase and shade out the grass. Forage production can be increased by controlling brush, reseeding to desirable plants, and controlling grazing.

This soil is planted to peanuts, corn, and forage sorghums. Lime is needed in some areas to help overcome acidic soil conditions. Leaving crop residue on or near the surface helps conserve moisture, reduce crusting, and maintain tilth. Planting or harvesting can be delayed briefly after heavy rainfall. In some areas, proper row direction is needed to help remove excess surface water.

This soil has potential for wildlife habitat. Areas are inhabited by deer, doves, quail, turkeys, squirrels, and furbearers. Adequate food is produced; however, where brush is dense, food production is reduced. Cultivated areas produce additional forage and grain sorghums.

This soil is poorly suited to most urban uses. The main limitation is the potential for shrinking and swelling with changes in moisture content. Low strength is a limitation for local roads and streets. The

very slow permeability is a limitation to septic tank absorption fields.

This soil is poorly suited to most recreational uses. The very slow permeability is a limitation.

This soil is in capability subclass 3w and the Claypan Savannah ecological site.

LuC—Luling clay, 3 to 5 percent slopes

This deep, gently sloping, clayey soil is on convex uplands. Gilgai microrelief consisting of microknolls and microdepressions are in some untilled areas. Areas are oval to elongated in shape. They range from 20 to more than 100 acres in size, averaging 40 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 6 inches, slightly alkaline, dark grayish brown clay

Subsurface layer:
6 to 16 inches, slightly alkaline, very dark grayish brown clay

Subsoil:
16 to 34 inches, slightly alkaline, dark grayish brown clay that has common intersecting slickensides
34 to 53 inches, moderately alkaline, light olive gray and pale olive clay that has common intersecting slickensides

Underlying material:
53 to 72 inches, slightly alkaline, light gray bedded shale

Important soil properties—

Available water capacity: moderate
Permeability: very slow
Drainage: well drained
Runoff: medium
Water table: none within a depth of 6 feet
Root zone: deep
Shrink-swell potential: very high
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Denhawken, Elmendorf, and Normangee soils. The Denhawken and Elmendorf soils are on side slopes and footslopes. The Normangee soil is higher on the landscape. The included soils make up less than 20 percent of the map unit.

This soil is used mainly for rangeland; however, some areas are cultivated and others are used for pasture. The climax vegetation consists of mid and tall grasses and an overstory of scattered trees along the drainageways. Tall grasses grow well where grazing is properly managed; however, continued close grazing causes the tall grasses to lose their vigor. They are then replaced by short grasses, weeds, cactus, and brush. Controlled grazing increases production and helps improve wildlife food and cover.

This soil is suited to grain and forage sorghums. Small grain crops are grown for pasture or hay. Deep, wide cracks form in the soil when it is dry. It is difficult to work during extremes in moisture content. Continuous tillage at the same depth causes this soil to develop a plow pan that impedes the movement of roots, air, and water. Surface crusting is common. The root zone is deep, but penetration by roots is slowed by the clayey layers. Effective conservation practices include controlling erosion and maintaining tilth. Terracing and farming on the contour slow runoff and reduce erosion. Growing crops that produce large amounts of residue and growing deep-rooted legumes help maintain tilth and aerate the soil.

Pasture plants, such as improved bermudagrasses, old world bluestem, gordo bluestem, kleingrass, johnsongrass, and vetch, are adapted to this soil. Seedbeds are difficult to establish and puddles form if the soil is grazed when wet. Fertilization, weed control, and controlled grazing help maintain high production.

This soil has potential for wildlife habitat. Deer, doves, quail, and other animals use areas of the soil for food and cover. If brush is thick and dense, deer use the areas for resting and escape. Planting small grain crops in the winter provides additional forage for deer. Tall native grasses provide nesting sites for turkeys.

This soil is poorly suited to most urban uses. Potential for shrinking and swelling with changes in moisture, corrosivity to uncoated steel, and very slow permeability are the main limitations. Protection against cave-ins is needed where this soil is excavated. These limitations can be partly overcome with good design and careful installation.

This soil is moderately suited to most recreational uses. The limitations are very slow permeability, clayey texture, and small stones on the surface.

This soil is in capability subclass 3e and the Blackland ecological site.

Na—Navidad fine sandy loam, rarely flooded

This very deep, nearly level, loamy soil is on flood plains of the Colorado River. Many of the non-cultivated areas contain low ridges and swales. The surface is plane to very gently undulating. Areas are oblong to oval in shape and are parallel to the river. Areas range

from 30 to more than 300 acres in size, averaging 200 acres. Slopes are 0 to 1 percent.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 12 inches, moderately alkaline, dark grayish brown fine sandy loam

Subsurface layer:
12 to 31 inches, moderately alkaline, dark grayish brown fine sandy loam

Underlying material:
31 to 59 inches, moderately alkaline, dark yellowish brown fine sandy loam
59 to 74 inches, moderately alkaline, dark brown loam
74 to 80 inches, moderately alkaline, brown fine sandy loam

Important soil properties—

Available water capacity: moderate
Permeability: moderately rapid
Drainage: well drained
Runoff: negligible
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: low
Hazard of water erosion: slight
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Bergstrom, Gad, and Smithville soils. The Bergstrom and Smithville soils are higher on the landscape. The Gad soil is in positions on the landscape similar to those of the Navidad soil. The included soils make up less than 15 percent of the map unit.

This soil is used mainly for pasture and cropland. A few acres are used for rangeland.

Most of the pasture areas are used for growing improved bermudagrasses. Other suited grasses are weeping lovegrass, kleingrass, old world bluestem, and arrowleaf clover. Fertilizer applications should be split because plant nutrients are easily leached out of the root zone. Effective conservation practices include controlling weeds and brush and controlling grazing.

This soil is suited to peanuts, small grain crops, and melons. Fruit and nut orchards, vineyards, and some truck crops are also grown. Areas left bare are subject to wind erosion. The soil is easily tilled over a wide range of moisture conditions. Leaving crop residue on the surface and growing cool-season legumes help maintain tilth and reduce soil blowing.

Rangeland vegetation consists of mid and tall grasses and an overstory of scattered trees, such as pecan, cottonwood, and willow. Rangeland conservation practices needed include controlling brush and trees and using a proper grazing system.

This soil has potential for wildlife habitat. Woody plants, forbs, and grasses provide cover, browse, and seeds for game animals and birds.

This soil is not suited to urban uses because of the hazard of flooding.

This soil is moderately suited to most recreational uses. The main limitation is the hazard of flooding.

This soil is in the capability subclass 1 and the Loamy Bottomland ecological site.

Nd—Navidad fine sandy loam, occasionally flooded

This very deep, nearly level, loamy soil is on flood plains (fig. 13). It is subject to flooding during the cool season, for short to moderate periods, about once each 2 to 25 years. The surface is smooth and areas are oblong to elongated in shape. They range from 10 to more than 50 acres in size, averaging 50 acres. Slopes are 0 to 1 percent.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 6 inches, slightly alkaline, grayish brown fine sandy loam

Subsurface layer:
6 to 39 inches, neutral, grayish brown fine sandy loam
39 to 45 inches, neutral, dark grayish brown fine sandy loam that has thin strata of loam

Underlying material:
45 to 80 inches, neutral, brown fine sandy loam that has thin strata of dark grayish brown sandy clay loam and pale brown loamy fine sand

Important soil properties—

Available water capacity: moderate
Permeability: moderately rapid
Drainage: well drained
Runoff: negligible
Water table: none within a depth of 6 feet, though flooding occurs occasionally
Root zone: very deep
Shrink-swell potential: low
Hazard of water erosion: slight
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Degola and Uhland soils. The Degola soils are in positions on the landscape similar to those of the

Figure 13.—Old bridges are common in Fayette County. This bridge is over a stream in an area of Navidad fine sandy loam, occasionally flooded.

Navidad soil. The sandy Uhland soil is adjacent to stream channels. The included soils make up 5 to 15 percent of the map unit.

Most areas of this soil were used for cropland, but are now used extensively for pasture. A few acres are used for cropland and rangeland.

Pasture areas are suited to forage plants, such as improved bermudagrasses, kleingrass, weeping lovegrass, arrowleaf clover, and singletary peas. Vigor and production can be maintained or increased by applying a complete fertilizer, controlling weeds, and controlling grazing to maintain adequate stubble height.

This soil is suited to crops, such as peanuts, corn, and forage and grain sorghums. Fruit and nut orchards, melons, vineyards, and some truck crops are grown in areas where the hazard of flooding is less likely. The soil is easy to till over a wide range of moisture conditions. It is readily permeable to roots, air, and moisture. Areas left bare are subject to wind erosion. Leaving crop residue on the surface and growing cool-season legumes help maintain soil tilth and control soil blowing.

Native rangeland consists of mid and tall grasses and an overstory of pecan, elm, hackberry, oak, and willow trees. Woody plants have developed thick stands where grazing has been close and continuous. Controlling brush and using a proper grazing system can restore productivity.

This soil has potential for wildlife habitat. The area is inhabited by furbearers, deer, squirrels, turkeys, doves, and quail. Woody plants, forbs, and grasses provide good cover, browse, and seeds for game birds and animals.

This soil is not suited to urban uses. The main limitation is the hazard of flooding.

The soil is moderately suited to most recreational uses. The hazard of flooding is a limitation for camp areas and playgrounds.

This soil is in the capability subclass 2w and the Loamy Bottomland ecological site.

NmC—Normangee clay loam, 2 to 5 percent slopes

This deep, gently sloping, loamy soil is on uplands. The surface is convex. Areas are elongated to irregular in shape. They range from 10 to more than 200 acres in size, averaging 120 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 7 inches, slightly acid, dark grayish brown clay loam

Subsoil:
7 to 20 inches, neutral, brown clay that has reddish brown mottles
20 to 29 inches, slightly alkaline, dark grayish brown clay that has brownish yellow mottles
29 to 50 inches, moderately alkaline, light olive brown clay that has yellowish brown mottles

Underlying material:
50 to 65 inches, moderately alkaline, stratified brownish yellow and light gray shale with clay texture that has strong brown mottles

Important soil properties—

Available water capacity: high
Permeability: very slow
Drainage: moderately well drained
Runoff: high
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: moderate in surface; high in subsoil
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Crockett, Denhawken, and Elmendorf soils. The Crockett soil is lower on the landscape. The Denhawken and Elmendorf soils are on side slopes and footslopes. Also included are areas of 3 to 5 acres of eroded Normangee soil. The included soils make up less than 15 percent of the map unit.

This soil is used mainly for rangeland; a few acres are used for cropland and pasture.

Rangeland consists of a mid and tall grass prairie and scattered trees. Dense mesquite brush and low-quality grasses have invaded most areas. These areas can be improved by controlling the brush and seeding desirable native grasses into a prepared seedbed. Native grasses grow well on this soil where grazing is properly managed. If grazing is close and continuous, the quality grasses lose their vigor, allowing the encroachment of poor quality grasses, weeds, and brush. Controlled grazing with an adequately planned grazing system is an essential conservation practice.

The main crops are forage sorghum and small grain crops used for hay production and supplemental grazing. This soil is limited by low natural fertility and rapid loss of moisture during summer. When dry, this soil becomes very hard and cracks extend into the subsoil. When wet, the cracks close and much water is lost through runoff. This soil can be cultivated only within a narrow range of moisture conditions. After cultivation and rainfall, a thick crust commonly forms on the surface when dry. Effective conservation practices include controlling erosion and improving fertility and tilth. Terracing, growing crops that produce large amounts of residue, and growing deep-rooted legumes help manage runoff, reduce erosion, and maintain tilth.

This soil is suited to pasture grasses, such as improved bermudagrasses, kleingrass, old world bluestem, weeping lovegrass, and arrowleaf clover. Using fertilizer and a controlled grazing system can increase yields and reduce erosion.

This soil has potential for wildlife habitat. Areas inhabited by doves, quail, rabbits, and deer produce adequate food for birds.

This soil is poorly suited to most urban uses. Potential for shrinking and swelling with changes in moisture, corrosivity to uncoated steel, and very slow permeability are the main limitations. These limitations can be partly overcome by good design and careful installation.

This soil is moderately suited to most recreational uses. The main limitation is very slow permeability.

This soil is in capability subclass 4e and the Claypan Prairie ecological site.

PaC—Padina fine sand, 2 to 5 percent slopes

This very deep, gently sloping, sandy soil is on uplands. The surface is concave and convex. Areas are oval to elongated in shape. They range from 130 to more than 500 acres in size, averaging 400 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 6 inches, slightly acid, yellowish brown fine sand

Subsurface layer:
6 to 58 inches, slightly acid, very pale brown fine sand

Subsoil:
58 to 65 inches, strongly acid, light brownish gray sandy clay loam that has strong brown and yellowish brown mottles
65 to 72 inches, strongly acid, white sandy clay loam that has yellowish brown mottles
72 to 80 inches, strongly acid, light gray sandy clay loam that has strong brown and red mottles

Important soil properties—

Available water capacity: low
Permeability: moderate
Drainage: well drained
Runoff: low
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: low
Hazard of water erosion: slight
Hazard of wind erosion: severe

Included with this soil in mapping are small areas of Robco soil along drainageways. Also included is a soil similar to the Padina soil that has a fine sand surface layer less than 40 inches thick and a red, loamy subsoil. The included soils make up less than 25 percent of the map unit.

This soil is used mainly for rangeland. A few acres are used for pasture and cropland.

The native vegetation is an understory of tall and mid grasses and an overstory of post oak, blackjack oak, and hickory trees. Yaupon and juniper are abundant in many areas and have shaded out the grass. Brush control and controlled grazing are important conservation practices. This soil is not suited to stock ponds because of seepage.

Pasture plants, such as weeping lovegrass and improved bermudagrasses, are adapted to this soil. Production is limited by low fertility and low available moisture during the summer growing season. Seedbeds are difficult to prepare because of the loose, sandy surface. Grass seedlings can be killed by the cutting action of blowing sand. Weed control, controlled grazing, and split applications of fertilizer are needed to maintain and improve production. Applications of lime may be necessary.

This soil is not suited to row crops because of the loose, droughty, sandy surface layer. A few acres are used for growing specialty crops, such as peanuts, tomatoes, and melons. The soil absorbs moisture well, but stores only a small amount. Vegetation is often stressed from the lack of moisture during summer dry periods. The soil has low content of organic matter and is susceptible to severe wind erosion when the surface is not protected by plant cover or residue. Conservation practices are needed to control soil blowing, conserve moisture, and improve soil fertility. Limiting tillage and growing cover crops that produce large amounts of residue and leaving the residue on the surface help control soil blowing, preserve soil moisture, and reduce soil temperature.

This soil has potential for wildlife habitat. Deer and turkeys are the main wildlife. In places, thick brush provides escape and resting cover for deer.

This soil is moderately suited to most urban uses. The main limitations are unstable sidewalls in excavations and poor filtration for septic tank absorption fields.

The soil is not suited to most recreational uses because of the sandy surface layer.

This soil is in capability subclass 3e and the Deep Sand ecological site.

PD—Pits and Dumps, saline

This map unit consists of deep pits and mounds of saline earth that were created during the excavation of bentonite. They are on the uplands of the Cadell Formation. Areas are irregular to elongated in shape. They range from 15 to 175 acres in size, averaging 80 acres. Slopes range from 0 to 90 percent.

The areas are 24 to 80 percent pits, 10 to 72 percent dumps, and 4 to 24 percent included soils. A typical area consists of 56 percent pits, 27 percent dumps, and 17 percent included soils. The components do not occur in a regular pattern.

Pits have vertical walls, are 10 to 40 feet deep, and are partly or completely filled with water in most years. They range from 5 to 125 acres in size.

Dumps consist of original soil material mixed with 8 to 20 feet of the underlying shale and loamy material which was dumped in piles near the pits. They are 5 to more than 50 feet in height. Dumps range from 2 to 100 acres in size.

Included with this map unit are small areas of Cadell, Gredge, and Zack soils. The included soils make up less than 25 percent of the map unit.

This map unit is used mainly for rangeland or wildlife habitat.

Many areas are still being mined. Vegetation is very difficult to establish because of the severe hazard of erosion, high salinity, and low fertility. Outwash from the mine spoil onto surrounding soils caused them to become droughty. Salinity ranges from 6 to 10 mmhos/cm. In a few areas that are not eroded or grazed, vegetation consists mainly of brush, weeds, and annual grasses. The salt has

Figure 14.—Isolated areas of water and sparse vegetation are common in areas of Pits and Dumps, sandy.

leached from the upper few inches of the soil material in most areas. Salty and droughty conditions make this unit best suited to salt-tolerant cool-season plants. Grazing should be controlled.

This map unit has potential for wildlife habitat. Doves, quail, and songbirds inhabit the areas. Waterfowl use the water areas for feeding and resting.

This map unit is in capability subclass 8s and is not assigned an ecological site.

PS—Pits and Dumps, sandy

This map unit consists of deep excavations and mounds of mixed soil material. It is in areas that are left after sand and gravel mining operations are suspended (fig. 14). Areas are mainly on terraces of the Colorado River. These areas are irregular in shape. They range from 10 to 150 acres in size, averaging 100 acres. Slopes range from 1 to 5 percent.

The areas are 16 to 60 percent pits, 32 to 76 percent dumps, and 7 to 25 percent included soils. A typical area consists of 33 percent pits, 50 percent dumps, and 17 percent included soils. The components do not occur in a regular pattern.

Pits were excavated during the mining of sand and gravel. They have vertical walls, are 5 to 40 feet deep, and commonly are partly or completely filled with water in most years. Pits range from 8 to 50 acres in size.

Dumps are mounds of soil materials 5 to more than 80 feet high that are gently sloping to steep. The soil materials are sandy to loamy overburden or by-products

of mining operations. The original soil layers have been mixed to a depth of more than 80 inches. Throughout the profile, strata of clay and silt are apparent. Dumps range from 8 to 65 acres in size.

Included in the map unit are small areas of Burleson, Branyon, Dutek, Gholson, and Smithville soils. The included soils make up less than 25 percent of the map unit.

This map unit is used mostly for rangeland or wildlife habitat. Some areas are still mined.

Native vegetation consists of sparse forbs, weeds, and scattered willow trees.

This map unit has potential for wildlife habitat. Doves, quail, and songbirds inhabit the areas. Deer pass through on the way to nearby food. Some water areas are stocked with catfish and bass. Waterfowl use the areas for feeding and resting.

This map unit is in capability subclass 8s and is not assigned an ecological site.

Pu—Pursley clay loam, frequently flooded

This very deep, nearly level, loamy soil is on flood plains of streams that drain from loamy and clayey prairies. Flooding occurs once or more every 2 years. Flooding is brief and occurs during periods of high rainfall in spring and fall. Surfaces are very gently undulating with a few shallow channels. Areas are elongated in shape. They range from 20 to about 600 acres in size, averaging 300 acres. Slopes are 0 to 1 percent.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 14 inches, slightly alkaline, dark grayish brown clay loam

Subsoil:
14 to 34 inches, moderately alkaline, grayish brown loam

Underlying material:
34 to 48 inches, moderately alkaline, grayish brown clay loam
48 to 56 inches, moderately alkaline, dark grayish brown clay loam
56 to 69 inches, moderately alkaline, grayish brown loam
69 to 80 inches, moderately alkaline, grayish brown clay loam

Important soil properties—

Available water capacity: high
Permeability: moderate
Drainage: well drained
Runoff: low
Water table: none within a depth of 6 feet
Root zone: deep
Shrink-swell potential: moderate
Hazard of water erosion: slight
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Bosque and Ganado soils. The Bosque soil has a dark colored surface layer more than 20 inches thick and occurs at random. The Ganado soil has a thick, clayey surface layer and is in depressional areas. Also included are soils on natural levees near stream channels that have a light colored surface layer and other soils that have a thick sandy layer below the surface layer. A few small areas of the Pursley soil that is occasionally flooded are included. The included soils make up less than 25 percent of the map unit.

This soil is used for pasture or rangeland. Only a few areas are used for cropland because of the hazard of flooding.

This soil is suited to switchgrass, kleingrass, and improved bermudagrasses.

This soil supports native vegetation of mid and tall grasses, forbs, and trees. The trees are mostly pecan, elm, oak, hackberry, and cottonwood. Woody plants are in dense stands in some areas where heavy grazing has reduced the vigor and density of the productive grasses.

This soil is not suited to cropland because of the hazard of flooding. It has natural fertility and high organic matter content. Areas that can be protected from flooding are suitable for use as cropland.

This soil has potential for wildlife habitat. Areas are inhabited by deer, doves, quail, and squirrels. The soil produces forage for deer. Wet depressional areas are used by waterfowl, egrets, and other birds.

This soil is not suited to urban and recreational uses. The hazard of flooding is the main limitation.

This soil is in capability subclass 5w and the Loamy Bottomland ecological site.

RbC—Rabbs clay loam, 5 to 8 percent slopes

This very deep, moderately sloping, loamy soil is on side slopes between flood plains and low terraces. The surface is convex. Areas are narrow and elongated and they follow the contour of the slope. They range from 10 to more than 80 acres in size, averaging 60 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 6 inches, moderately alkaline, dark brown clay loam

Subsoil:
6 to 18 inches, moderately alkaline, reddish brown clay loam
18 to 38 inches, moderately alkaline, light reddish brown clay loam
38 to 80 inches, moderately alkaline, reddish yellow loam

Important soil properties—

Available water capacity: high
Permeability: moderate
Drainage: well drained
Runoff: high
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: low
Hazard of water erosion: severe
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Bergstrom, Branyon, Gholson, Smithville, and Wilson soils. These soils are higher on the landscape on terraces. Areas where most of the surface layer is eroded away and areas where the surface layer is fine sandy loam are also included. The included soils make up as much as 15 percent of the map unit.

This soil is used mainly for rangeland and pasture. A few areas are mined for the underlying gravel.

The typical vegetation in rangeland is clover, mesquite, Texas wintergrass, rescue grass, and scattered live oak. Brushy plants and weeds invade following prolonged periods of continuous overgrazing. Effective conservation practices are brush and weed control and controlled grazing.

Many formally cultivated areas are now used for pasture. Adapted pasture plants include improved bermudagrasses, kleingrass, old world bluestem, sweetclover, and vetch. Effective conservation practices are weed control, fertilization, and controlled grazing.

A few areas are planted to small grain crops, sorghums, or corn. Effective conservation practices are controlling erosion, improving soil tilth, and conserving soil moisture. Terracing and farming on the contour help slow runoff and reduce erosion. Grassed waterways are needed for terrace outlets. Growing close-spaced crops that produce large amounts of residue on or near the surface helps slow runoff and reduce erosion.

This soil has potential for wildlife habitat. Areas are inhabited by doves, quail, and deer. A good selection of forbs for deer forage is available.

This soil is moderately suited to most urban uses. The main limitations are slope and low strength.

This soil is moderately suited to most recreational uses. Slope is a limitation for playgrounds.

This soil is in capability subclass 4e and the Clay Loam ecological site.

RhB—Rehburg loamy fine sand, 1 to 3 percent slopes

This deep, very gently sloping, sandy soil is on uplands and stream terraces. The surface is plane to convex. Areas are oval or irregular in shape. They range from 10 to more than 200 acres in size, averaging 40 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 8 inches, moderately acid, brown loamy fine sand

Subsurface layer:
8 to 26 inches, strongly acid, pale brown loamy fine sand

Subsoil:
26 to 34 inches, very strongly acid, light brownish gray sandy clay that has brownish yellow and strong brown mottles
34 to 44 inches, very strongly acid, light gray sandy clay loam that has yellowish mottles
44 to 56 inches, strongly acid, light gray sandy clay loam that has brownish mottles

Underlying material:
56 to 65 inches, neutral, light yellowish brown weakly cemented tuffaceous sandstone that is interbedded with pale olive clay

Important soil properties—

Available water capacity: low
Permeability: very slow
Drainage: moderately well
Runoff: low
Water table: at a depth of 3 to 4 feet, perched, December to April
Root zone: deep
Shrink-swell potential: moderate
Hazard of water erosion: moderate
Hazard of wind erosion: severe

Included with this soil in mapping are small areas of Rutersville and Shiro soils. The Rutersville soil is lower on the landscape. The Shiro soil has a surface layer less than 20 inches thick and is in positions on the landscape similar to those of the Rehburg soil. Small areas of closely similar soils that have slopes of more

than 5 percent are also included. The included soils make up as much as 15 percent of the map unit.

This soil is used mainly for pasture or native rangeland. A few areas are used for cropland.

This soil is suited to pasture plants, such as improved bermudagrasses, lovegrass, vetch, and kleingrass. Production is increased by applying essential fertilizer elements, including lime. Applications of nitrogen are needed at least twice during the growing season because it is easily leached through the thick, sandy surface. Weed control and controlled grazing are also essential for increased production.

The areas used for rangeland have mid and tall native grasses and an overstory of juniper, post oak, blackjack oak, hickory, and yaupon. Heavy and continuous grazing causes the overstory to thicken. Effective conservation practices are planting desirable range plants, controlling brush and trees, and controlling grazing.

A few acres of this soil are planted to peanuts, melons, and forage sorghums. Low natural fertility; the droughty nature of the thick, sandy surface layer; seasonal wetness; and soil blowing are the most restricting limitations. Leaving crop residue on the surface adds to the natural fertility and helps prevent the soil from blowing.

This soil has potential for wildlife habitat. Areas are inhabited by deer, doves, quail, and squirrels. That feed on acorns and other forbs. Turkeys are in those areas where tall grasses are available for cover and nesting. If brush is dense, habitat for wildlife declines, although deer use the brush for escape and resting cover.

This soil is moderately suited to most urban uses. The main limitations are the potential for shrinking and swelling, seasonal wetness, cave-ins, and corrosivity to uncoated steel and concrete. Protection against cave-ins is needed when this soil is excavated. This soil is not suited to septic tank absorption fields because of very slow permeability.

This soil is moderately suited to most recreational uses. The limitations are very slow permeability and the sandy surface layer.

This soil is in capability subclass 3e and the Sandy ecological site.

RkC—Rek extremely gravelly coarse sandy loam, 2 to 5 percent slopes

This very deep, gently sloping, gravelly and loamy soil remains on upland ridges and side slopes after the surface gravel and cobbles are removed. In some areas, the Rek soil is lower by 2 feet or more than the unmined, surrounding gravelly soils. Mining operations continue in some areas, and the acres of this soil are increasing (fig. 15). The surface generally has many small depressions and small gravelly mounds; however, in places it has been shaped and smoothed. Areas are elongated to irregular in shape. They range from 7 to more than 200 acres in size, averaging 80 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:

0 to 3 inches, very strongly acid, pink, extremely gravelly coarse sandy loam that has 5 percent cobbles and 75 percent pebbles

Subsoil:

3 to 7 inches, extremely acid, red gravelly clay that has 5 percent cobbles and 25 percent pebbles

7 to 22 inches, extremely acid, light gray clay that has 2 percent cobbles and 5 percent pebbles

22 to 37 inches, extremely acid, light brownish gray sandy clay that has 2 percent pebbles

37 to 63 inches, extremely acid, light gray sandy clay loam that has red and brownish yellow mottles

Underlying material:

63 to 80 inches, extremely acid, grayish brown weakly cemented sandstone that has texture of fine sandy loam

Important soil properties—

Available water capacity: moderate
Permeability: very slow
Drainage: moderately well drained
Runoff: high
Water table: at a depth of 2.5 to 3.5 feet, perched, November to April
Root zone: very deep
Shrink-swell potential: high
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Straber and Tremona soils. The Straber soil has a gravelly surface layer as much as 20 inches thick. The Tremona soil has a gravelly surface layer more than 20 inches thick. Also included is soil that contains more gravel in the subsoil than the Rek soil, soil that is underlain by strongly cemented sandstone, and a similar soil that has a solum thinner than the Rek soil. The included soils make up as much as 30 percent of the map unit.

This soil is used for rangeland. Most of the native vegetation was destroyed during mining operations. The rest of the surface material, if any, and the subsoil are droughty and infertile. The subsoil ranges from extremely acid to slightly acid. Native vegetation consists mainly of annual threeawns and poor quality bluestem, paspalum, and annual weeds. Before desirable plants can be established, soil fertility must be increased

by adding agricultural lime to overcome acidic soil conditions and adding a complete fertilizer. Lime should not be applied if pine trees are to be established. Shaping is needed to smooth small depressions and mounds left from mining in some areas. Small contoured ridges can help slow runoff and increase water infiltration. Adding organic matter helps increase infiltration, raise fertility, lower soil temperature, and increase the available water capacity. Once vegetation is established, grazing should be controlled with planned rotations.

This soil has potential for wildlife habitat. Doves, deer, and turkeys inhabit the areas.

This soil is poorly suited to most urban uses. The main limitations are the potential for shrinking and swelling with changes in moisture, low strength that affects streets and roads, acidity that affects steel and concrete, corrosivity to uncoated steel and concrete, and small stones on the surface. This soil is not suited to septic tank absorption fields because of wetness and very slow permeability. These limitations can be partly overcome by good design and careful installation.

This soil is not suited to most recreational uses because of small stones on the surface.

This soil is in capability subclass 4e and the Gravelly ecological site.

RnC—Renish-Rock outcrop complex, 2 to 8 percent slopes

This map unit consists of shallow, gently and moderately sloping, loamy soils and rock outcrop. The surface is convex. Areas are elongated to oval in shape. They range from 5 to more than 200 acres in size, averaging 80 acres.

The Renish soil makes up about 86 percent of the unit, and rock outcrop makes up about 14 percent. The rock outcrop is white, strongly cemented, calcareous sandstone that is coarsely fractured (fig. 16). It is mainly higher on the landscape; however, narrow ledges outcrop at mid slope. A few sandstone cobbles and stones are exposed on the surface. Most of the fragments and rock outcrop are covered with as much as 4 inches of soil. The soils of this map unit are so intricately mixed that separation is not practical at the scale used for mapping.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:

0 to 7 inches, slightly alkaline, dark grayish brown fine sandy loam

Figure 15.—The gravel in the surface layer of Rek extremely gravelly coarse sandy loam, 2 to 5 percent

Figure 16.—Sandstone, in this area of Renish-Rock outcrop complex, 2 to 8 percent slopes, was used as brick by early settlers.

Subsurface layer:
7 to 12 inches, slightly alkaline, dark brown fine sandy loam

Underlying material:
12 to 15 inches, calcareous, moderately alkaline strongly cemented sandstone

Important soil properties—

Available water capacity: very low
Permeability: moderate
Drainage: well drained
Runoff: high
Water table: none within a depth of 6 feet
Root zone: shallow
Shrink-swell potential: low
Hazard of water erosion: moderate
Hazard of wind erosion: moderate

Included with this soil in mapping is the Carbengle soil. Also included are soils less than 10 inches deep to bedrock. Some areas have few to many rounded siliceous pebbles and cobbles on the surface and imbedded in the soil. Areas associated with the Colorado River and called the “Bluff” are escarpments and consist of short, very steep slopes. These areas are included in this map unit. The included soils make up less than 20 percent of the map unit.

This map unit is used mainly for rangeland. The rock outcrop and shallow depth to bedrock restricts its use for cropland or improved pasture.

Managed rangeland areas contain mid and tall grasses and an overstory of scattered live oak trees. Continuous and heavy grazing have allowed brush and other woody plants to invade and increase in some areas. The dense brush has replaced most of the grasses, allowing the soil to erode and expose the

underlying bedrock. Effective conservation practices are controlled grazing, brush control, and reseeding for cover.

This map unit has potential for wildlife habitat areas. Deer, doves, and quail inhabit the areas. Forbs and grasses provide seed for game birds and animals. A good selection of forbs is available for deer forage and in many areas, cover is available for escape and resting. Overgrazing reduces the food and cover for wildlife and allows brush to increase when food-producing plants are reduced.

This map unit is poorly suited to most urban uses because of the depth to bedrock and the rock outcrop. These limitations have been partly overcome in many areas to take advantage of the scenic views and large live oak trees.

Recreational use is mainly limited to paths, trails, and picnic areas.

This map unit is in capability subclass 6e and the Chalky Ridge ecological site.

RnE—Renish-Rock outcrop complex, 8 to 20 percent slopes, very stony

This map unit consists of shallow, strongly sloping and moderately steep, loamy soils and rock outcrop. The surface is convex. Areas are elongated in shape. They range from 20 to 300 acres in size, averaging 200 acres.

The Renish soil makes up about 75 percent of the unit, and rock outcrop makes up 25 percent. The rock outcrop is white, strongly cemented, calcareous sandstone that is coarsely fractured. It is mainly higher on the landscape; however, narrow ledges outcrop at mid slope. Siliceous gravel and cobbles are scattered on the surface and imbedded in the soil. The soils of this map unit are so intricately mixed that separation is not practical at the scale used for mapping.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 9 inches, moderately alkaline, very dark grayish brown gravelly fine sandy loam

Subsurface layer:
9 to 15 inches, moderately alkaline, dark grayish brown sandy clay loam

Underlying material:
15 to 18 inches, calcareous, moderately alkaline strongly cemented sandstone

Important soil properties—

Available water capacity: very low
Permeability: moderate
Drainage: well drained
Runoff: very high
Water table: none within a depth of 6 feet
Root zone: shallow
Shrink-swell potential: low
Hazard of water erosion: severe
Hazard of wind erosion: slight

Included with this soil in mapping are Carbengle, Greenvine, and Latium soils. These soils are in lower positions on the landscape. Areas in this map unit that are associated with the Colorado River and called the “Bluff” are escarpments and consist of short, very steep slopes. Also included are soils that are less than 10 inches deep to bedrock. The included soils make up less than 20 percent of the map unit.

The soils of this map unit have potential for wildlife habitat and areas are inhabited by deer, doves, and quail. Forbs and grasses provide seed for game birds and animals. A good selection of forbs are available for deer forage. In many areas, cover is available for escape and resting.

These soils are not suited to most urban uses because of the depth to bedrock, the rock outcrop, and steep slopes.

Recreational use is mainly limited to paths and trails. Caution is needed because of falling rocks.

This map unit is in capability subclass 7s and the Chalky Ridge ecological site.

RoB—Robco fine sand, 1 to 3 percent slopes

This very deep, very gently sloping, sandy soil is on upland ridges and side slopes. The surface is plane to convex. Areas are irregular to elongated in shape. They range from 10 to 125 acres in size, averaging 40 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 8 inches, slightly acid, pale brown fine sand

Subsurface layer:
8 to 28 inches, slightly acid, very pale brown fine sand that has brownish yellow mottles

Subsoil:
28 to 35 inches, very strongly acid, yellowish brown sandy clay loam that has light brownish gray

mottles; 30 percent of the horizon is light gray tongues and interfingerings of loamy fine sand
35 to 49 inches, very strongly acid, light brownish gray sandy clay loam that has red and strong brown mottles
49 to 56 inches, strongly acid, mottled yellowish red and light brownish gray sandy clay loam
56 to 68 inches, strongly acid, very pale brown sandy clay loam that has reddish yellow and light brownish gray mottles
68 to 74 inches, slightly acid, mottled light brownish gray and reddish yellow sandy clay loam

Important soil properties—

Available water capacity: moderate
Permeability: slow
Drainage: moderately well drained
Runoff: low
Water table: at a depth of 1.5 to 3.5 feet, perched, January to April
Root zone: very deep
Shrink-swell potential: high in the upper part of the subsoil, moderate in the lower part
Hazard of water erosion: slight
Hazard of wind erosion: severe

Included with this soil in mapping are small areas of Chazos, Gredge, and Padina soils. The Chazos soil has a sandy surface layer less than 20 inches thick. The Gredge soil has a loamy surface layer. The Padina soil has a sandy surface layer more than 40 inches thick. These soils are in positions on the landscape similar to those of the Robco soil. Also included is a soil similar to the Robco soil, except the subsoil has a higher clay content. The included soils make up less than 15 percent of the map unit.

This soil is used mainly for pasture and rangeland. A few areas are used for cropland.

This soil is suited to improved bermudagrasses, kleingrass, weeping lovegrass, old world bluestem, arrowleaf clover, and vetch. Forage yields from pasture and hayland plants are high during the spring growing season. Applications of fertilizer and lime, weed control, and controlled grazing can increase production.

This soil has rangeland vegetation consisting of mid and tall grasses and an overstory of oak. Tall grasses grow well where grazing is properly managed. Continued close grazing causes the tall grasses to lose their vigor. Effective conservation practices are brush control and controlled grazing.

This soil is suited to crops, such as watermelons and peanuts. It absorbs water readily, but is low in content of organic matter. It is easy to work, but areas left bare are easily eroded by wind. This soil does not store adequate water for plants to grow well during dry summer months. Leaving crop residue on or near the surface, growing alternate crops in strips, and using cover crops can help reduce erosion and maintain tilth and fertility.

This soil has potential for wildlife habitat. Deer, squirrels, doves, and quail inhabit the areas. If brush is dense, habitat for most wildlife declines, although deer use the brush for escape and resting cover.

This soil is poorly suited to most urban uses. The main limitations that affect urban uses are wetness, potential for shrinking and swelling, slow permeability, seepage, and high corrosivity to uncoated steel.

This soil is poorly suited to most recreational uses because of the loose, sandy surface layer.

This soil is in capability subclass 2e, and the Sandy ecological site.

RrB—Robco loamy fine sand, 1 to 3 percent slopes

This very deep, very gently sloping, sandy soil occupies low stream terraces. These soils are slightly higher on the landscape than adjacent flood plains. The surface is plane to convex. Areas are oval to elongated in shape. They range from 8 to 40 acres in size, averaging 20 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 13 inches, moderately acid, pale brown loamy fine sand

Subsurface layer:
13 to 23 inches, moderately acid, very pale brown loamy fine sand

Subsoil:
23 to 43 inches, moderately acid, pale brown sandy clay loam that has grayish brown and strong brown mottles
43 to 48 inches, moderately acid, grayish brown clay loam that has reddish brown mottles
48 to 64 inches, moderately acid, very pale brown sandy clay loam that has yellowish mottles

Underlying material:
64 to 72 inches, neutral, light yellowish brown sandy clay loam

Important soil properties—

Available water capacity: moderate

Permeability: slow
Drainage: moderately well drained
Runoff: low
Water table: at a depth of 1.5 to 3.5 feet, perched, January to April
Root zone: very deep
Shrink-swell potential: high in the upper part of the subsoil, moderate in the lower part
Hazard of water erosion: slight
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Warda and Uhland soils. The Warda soil has a dark, loamy surface layer. It is in positions on the landscape similar to those of the Robco soil. The Uhland soil is adjacent to stream channels. Also included is a similar soil that has a thin, fine sandy loam surface layer, and areas underlain by fine sand at a depth below 40 inches. The included soils make up less than 20 percent of the map unit.

This soil is used mainly for pasture. A few areas are used for cropland and rangeland.

This soil is suited to improved bermudagrasses, kleingrass, weeping lovegrass, arrowleaf clover, old world bluestem, and vetch. Forage can be increased by controlling weeds, adding a complete fertilizer, and controlling grazing.

A few acres of this soil are planted to peanuts, corn, and forage and grain sorghums. This soil is suited to truck crops, such as melons. Crop residue left on or near the surface helps conserve moisture, reduce soil blowing, and maintain tilth and productivity.

Rangeland areas have mid and tall grasses beneath a scattered canopy of oak trees. Where grazing has been heavy and continuous, the desirable grasses have been replaced by annuals and weeds.

This soil has potential for wildlife habitat. Deer, turkeys, squirrels, and doves inhabit the areas. They feed on acorns, forbs, and seeds. If brush is dense, food and habitat for most wildlife decreases; however, deer use the brush for escape and resting cover.

This soil is poorly suited to most urban uses. The main limitations are wetness, potential for shrinking and swelling, slow permeability, seepage, and corrosivity to uncoated steel.

This soil is moderately suited to most recreational uses. The limitations are wetness and the sandy surface layer.

This soil is in capability subclass 2e and the Sandy ecological site.

Rt—Roetex clay, frequently flooded

This very deep, nearly level, clayey soil is on flood plains of the Colorado River. Flooding, of brief to long duration, occurs 1 to 4 times each year. Areas are in slack water areas, depressions, in swales, or old channels. Slopes are 0 to 1 percent.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 11 inches, moderately alkaline, dark grayish brown clay

Subsoil:
11 to 33 inches, moderately alkaline, reddish gray clay that has dark gray mottles and yellowish brown mottles
33 to 41 inches, moderately alkaline, reddish brown clay that has dark gray mottles
41 to 72 inches, moderately alkaline, brown clay that has gray and strong brown mottles

Important soil properties—

Available water capacity: high
Permeability: very slow
Drainage: somewhat poorly drained
Runoff: low
Water table: at a depth of 0.5 to 2.0 feet, apparent, October to May
Root zone: very deep
Shrink-swell potential: high
Hazard of water erosion: slight
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Ships soil. The Ships soil is along the outer edges of some areas. Also included are small depressions that retain water most of the year and some artificially drained areas that are used for cropland. The included soils make up less than 10 percent of the map unit.

This soil is used mainly for pasture or wooded rangeland and wildlife habitat. A few artificially drained areas are used for pecan production.

Most pasture areas are artificially drained and are suited to improved bermudagrasses. Seasonal flooding and poorly drained areas limit production. Weed control, fertilization, and controlled grazing are the conservation practices used to maintain plant vigor and increase forage production.

Areas used for rangeland have a thick overstory of oak, elm, hackberry, ash, and cottonwood trees. Most forage used by livestock is produced during the cool season.

This soil has potential for wildlife habitat. Waterfowl and deer use the areas for feeding, resting, and escape.

This soil is not suited to recreational and urban uses. The main limitation is the hazard of flooding.

This soil is in capability subclass 5w and the Clayey Bottomland ecological site.

RvA—Rutersville loamy fine sand, 0 to 2 percent slopes

This deep, nearly level and very gently sloping, sandy soil is on interstream divides and concave footslopes. The surface is plane to slightly convex. Areas are elongated to oval in shape. They range from 10 to more than 120 acres in size, averaging 100 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 7 inches, neutral, grayish brown loamy fine sand

Subsurface layer:
7 to 14 inches, neutral, white loamy fine sand that has brown mottles

Subsoil:
14 to 24 inches, strongly acid, light brownish gray clay loam
24 to 34 inches, very strongly acid, light brownish gray sandy clay loam that has yellowish brown mottles
34 to 46 inches, strongly acid, light brownish gray fine sandy loam that has yellowish brown mottles
46 to 54 inches, moderately acid, light gray fine sandy loam that has brownish yellow mottles

Underlying material:
54 to 65 inches, slightly acid, light gray weakly cemented and weathered sandstone that has olive yellow mottles
65 to 79 inches, slightly acid, weakly cemented and weathered yellowish red and light gray stratified tuffaceous sandstone with some loamy lenses

Important soil properties—

Available water capacity: moderate
Permeability: slow
Drainage: moderately well drained
Runoff: medium
Water table: at a depth of 2.5 to 4.0 feet, perched, December to April
Root zone: very deep
Shrink-swell potential: high in the upper part of the subsoil, moderate in the lower part
Hazard of water erosion: slight
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Arol, Rehburg, Singleton, and Shiro soils. The Arol soil is in depressional areas and along small drainageways. The Rehburg soil is on sandy and mounded ridges. The loamy Singleton and sandy Shiro soils are on steeper parts of the landscape. Also included are soils that are closely similar to the Rutersville soil, except they are a few inches shallower to bedrock. The included soils make up less than 20 percent of the map unit.

This soil is used mainly for pasture and rangeland. A few acres are used for cropland.

Adapted pasture plants include improved bermudagrasses, switchgrass, and singletary peas. This soil produces high yields of forage during the spring. Timely fertilization, weed control, and controlled grazing are needed to maintain adequate stubble height.

Rangeland vegetation is mid and tall grasses and an understory of oak. Many areas have degenerated to thick stands of oaks, juniper, yaupon, and little grass. Some formerly cultivated areas now have weeds and grasses that are not palatable to livestock. Effective conservation practices include controlling brush and controlling grazing to maintain grass vigor.

Corn, peanuts, forage sorghums, and small grain crops are adapted to this soil. It absorbs moisture easily; however, a perched water table occurs near the surface following extensive periods of rainfall. Natural fertility and organic matter are low. Lime is needed in many pasture and cultivated areas to overcome acidic conditions.

This soil has potential for wildlife habitat. Areas are inhabited by deer, squirrels, quail, and doves. If brush is dense, habitat for most wildlife species declines, although deer use the brush for escape and resting cover.

This soil is poorly suited to most urban uses. Seasonal wetness, potential for shrinking and swelling with changes in moisture, slow permeability, and corrosivity to uncoated steel and concrete are limitations.

This soil is well suited to most recreational uses.

This soil is in capability class 3w and the Loamy Sand ecological site.

ScC—Schulenburg sandy clay loam, 3 to 8 percent slopes

This very deep, gently sloping and moderately sloping, loamy soil is on side slopes. The surface is convex. Areas are oval to elongated in shape and follow the contour of the slope. They range from 10 to 35 acres in size, averaging 30 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 5 inches, slightly acid, dark gray sandy clay loam

Subsurface layer:
5 to 13 inches, slightly acid, dark grayish brown sandy clay loam

Subsoil:
13 to 29 inches, neutral, brown sandy clay loam
29 to 36 inches, moderately alkaline, dark brown sandy clay loam
36 to 42 inches, moderately alkaline, dark brown sandy clay loam that has many concretions of calcium carbonate
42 to 49 inches, moderately alkaline, brown sandy clay loam that has common concretions of calcium carbonate
49 to 57 inches, moderately alkaline, yellowish brown sandy clay loam that has common concretions of calcium carbonate
57 to 80 inches, moderately alkaline, brownish yellow very fine sandy loam that has common concretions of calcium carbonate

Important soil properties—

Available water capacity: high
Permeability: moderate
Drainage: well drained
Runoff: medium to high
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: moderate
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Carbengle, Dubina, and Hallettsville soils. The Carbengle soil is in positions on the landscape similar to those of the Schulenburg soil. The sandy Dubina soil is higher on the landscape and the Hallettsville soil is lower. Also included are small areas where most of the surface layer is eroded away. The included soils make up less than 20 percent of the map unit.

This soil is used mostly for pasture and rangeland. A few acres are used for cropland.

Suited pasture plants include improved bermudagrasses, weeping lovegrass, kleingrass, and old world bluestem. Cool-season legumes, such as crimson clover, vetch, and arrowleaf clover, produce winter forage and add nutrients to the soil. Effective conservation practices are fertilization, weed control, and controlled grazing.

Rangeland vegetation is mid and tall grasses and scattered live oak trees. Poor quality plants grow on some previously cultivated rangeland. Effective conservation practices are brush control and controlled grazing.

This soil was previously planted to corn, cotton, grain and forage sorghums, and small grain crops. It has good tilth and can be worked over a wide range of soil moisture conditions. Effective conservation practices are terracing and leaving residue on or near the surface to slow runoff, maintain organic matter content, and improve tilth.

This soil has potential for wildlife habitat. Quail, doves, rabbits, songbirds, and deer inhabit the areas. Scattered live oak trees provide cover and food.

This soil is moderately suited to most urban uses. The main limitations affecting urban uses are seepage, slow percolation, and corrosivity to uncoated steel.

This soil is moderately suited to most recreational uses. Slope is a limitation for playgrounds.

This soil is in capability subclass 4e and the Clay Loam ecological site.

ShC—Shalba fine sandy loam, 2 to 5 percent slopes

This shallow, gently sloping, loamy soil is on upland ridges. The surface is convex. Areas are elongated to irregular in shape. They range from 5 to about 35 acres in size, averaging 20 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 5 inches, strongly acid, light brownish gray fine sandy loam

Subsoil:
5 to 16 inches, moderately acid, grayish brown clay

Underlying material:
16 to 24 inches, white strongly cemented tuffaceous sandstone

Important soil properties—

Available water capacity: very low
Permeability: very slow
Drainage: moderately well drained
Runoff: high
Water table: at a depth of 1.0 to 1.5 feet, perched, November to February
Root zone: shallow
Shrink-swell potential: low in the surface layer, high in the subsoil
Hazard of water erosion: moderate
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Arol, Koether, and Singleton soils. The Arol soil is lower on the landscape. The Koether soil has large tuffaceous sandstone fragments on the surface and is on side slopes. The Singleton soil is slightly lower on the landscape. Also included are a few shallow gullies

in some areas. The included soils and gullied areas make up less than 25 percent of the map unit.

This soil is used for rangeland and pasture.

Some areas of this shallow soil are planted to improved bermudagrasses. Applications of lime are essential for this acidic soil to use fertilizer elements efficiently.

Native rangeland areas have an overstory of post oak, juniper, yaupon, and live oak trees and an understory of short to tall grasses. Continuous grazing causes the brush to increase. Many areas have a dense woody overstory. Forage production can be increased by controlling brush and controlling grazing.

This soil has some potential for developing wildlife habitat. Deer, doves, and turkeys inhabit the areas. Adequate cover is available for resting and escape. Droughty conditions, dense brush, and low natural fertility limit food production. Brush management, carried out in strips or patterns, increases food supply.

This soil is poorly suited to most urban uses. The main limitations that affect its use are seasonal wetness, potential for shrinking and swelling, depth to rock, corrosivity to uncoated steel and concrete, and very slow permeability.

This soil is poorly suited to recreational uses. The main limitations are seasonal wetness and depth to bedrock.

This soil is in capability subclass 4s and the Claypan Savannah ecological site.

ShC2—Shalba fine sandy loam, 2 to 5 percent slopes, eroded

This shallow, gently sloping, loamy soil is on convex ridgetops. Areas are mostly old cultivated fields where erosion has removed most of the surface layer. Part of the subsoil is also eroded in places. A few shallow gullies and rills are in more sloping areas. Areas are mostly irregular in shape. They range from 15 to 40 acres in size, averaging 25 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 4 inches, moderately acid, light brownish gray fine sandy loam

Subsoil:
4 to 10 inches, strongly acid, dark grayish brown clay
10 to 18 inches, moderately acid, grayish brown clay

Underlying material:
18 to 24 inches, moderately alkaline, light gray weakly cemented tuffaceous material

Important soil properties—

Available water capacity: very low
Permeability: very slow
Drainage: moderately well drained
Runoff: high
Water table: at a depth of 1.0 to 1.5 feet, perched, November to February
Root zone: shallow
Shrink-swell potential: low in the surface layer; high in the subsoil
Hazard of water erosion: severe
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Burlewash, Shiro, and Singleton soils. The Burlewash and sandy Shiro soils are higher on the landscape. The Singleton soil is in positions similar to those of the Shalba soil. The included soils make up about 10 percent of the map unit.

This soil is used mainly for rangeland. A few acres are used for pasture.

The rangeland vegetation, in well managed areas, consists mainly of mid and tall grasses, such as little bluestem, grama grasses, indiangrass, and brownseed paspalum. Oak trees are widely scattered. Most rangeland areas have been continuously overgrazed to an extent that the oak trees have increased and brush, such as yaupon, juniper, and mesquite, have replaced the desirable grasses. Erosion continues where brush is dense. These areas can be improved by controlling brush, reseeding into a prepared seedbed, and controlling grazing.

A few acres of this soil are used for pasture. Improved bermudagrasses, weeping lovegrass, kleingrass, and vetch are adapted to the soil, although forage production is limited. This soil has low natural fertility and is easily eroded. The soil is droughty in areas of active erosion. The ability of the soil to take in and store moisture is decreased as the surface layer erodes away. Seedbeds are difficult to prepare because of limited remaining surface soil. A thick surface crust forms following rains.

This soil has some potential for wildlife habitat.

This soil is poorly suited to most urban uses. The main limitations that affect its use are seasonal wetness, the potential for shrinking and swelling, depth to bedrock, high corrosivity to uncoated steel and concrete, and very slow permeability.

This soil is poorly suited to recreational uses. Seasonal wetness and depth to bedrock are limitations.

This soil is in capability subclass 6e and the Claypan Savannah ecological site.

ShD4—Shalba-Gullied land complex, 3 to 8 percent slopes

The map unit consists of eroded, shallow, gently sloping and moderately sloping, loamy soils and gullied land on uplands. Vertical-walled gullies cut 2 to 20 feet deep into the bedrock. The gullies are 3 to more than 100 feet wide and commonly dissect areas in this unit at intervals of 65 to 250 feet. Gullied land comprises about 20 to 85 percent of the areas, averaging about 55 percent. Most of the Shalba soil between the gullies is eroded to where only a few inches of the surface layer remains. The surface is convex. Areas are irregular in shape. They range from 15 to more than 100 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 2 inches, moderately acid, grayish brown fine sandy loam

Subsoil:
2 to 14 inches, strongly acid, grayish brown clay

Underlying material:
14 to 24 inches, neutral, light gray and pale brown weakly cemented tuffaceous sandstone

Important soil properties—

Available water capacity: very low
Permeability: very slow
Drainage: moderately well drained
Runoff: high
Water table: at a depth of 1.0 to 1.5 feet, perched, November to February
Root zone: shallow
Shrink-swell potential: low in the surface layer, high in the subsoil
Hazard of water erosion: severe
Hazard of wind erosion: moderate

Included in this map unit are small areas of Burlewash and Singleton soils. The Burlewash soil is on lower slopes. The Singleton soil is in areas along drainageways. Also included are small eroded areas of the Burlewash soil. Erosion has removed much of the surface layer from these included soils. Some areas that have been shaped are also included in this unit. The included soils make up less than 20 percent of the map unit.

The soils of this map unit are used mainly for rangeland, recreation, and wildlife habitat because of the deep gullies.

These soils are suited to cropland.

In most rangeland areas, overgrazing has caused dense brush to replace the better native plants. Replacing the brush with grass and keeping a good grass cover can help increase rainfall absorption and decrease runoff. The thin surface layer and the dense, blocky, clayey subsoil release little moisture.

A few small areas of this map unit are used for pasture. Successful pasture establishment in critical areas can require diverting overhead water and mulching with plant residue. High levels of a complete fertilizer, weed control, and limited grazing are needed to maintain stands and reduce erosion.

The soils of this map unit have some potential for wildlife habitat.

These soils are poorly suited to most urban uses. The main limitations are seasonal wetness, potential for shrinking and swelling, and depth to bedrock.

The soils of this map unit are poorly suited to recreational uses. The main limitations are seasonal wetness and depth to bedrock.

This map unit is in capability subclass 7e and the Claypan Savannah ecological site.

Sp—Ships clay, occasionally flooded

This very deep, nearly level, clayey soil occupies depressional edges of wide flood plains. Flooding occurs, on the average, about once every 2 to 20 years. Flooding generally lasts less than 2 days. The surface is level to slightly concave and slopes are less than 1 percent. Areas are oval to elongated in shape. They range from 12 to more than 90 acres in size, averaging 70 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 5 inches, moderately alkaline, dark reddish brown clay

Subsurface layer:
5 to 31 inches, moderately alkaline, dark reddish brown clay that has few intersecting slickensides

Subsoil:
31 to 80 inches, moderately alkaline, reddish brown clay that has common intersecting slickensides

Important soil properties—

Available water capacity: high
Permeability: very slow
Drainage: moderately well drained
Runoff: low
Water table: none within a depth of 6 feet; occasionally flooded
Root zone: very deep

Shrink-swell potential: very high
Hazard of water erosion: slight
Hazard of wind erosion: slight

Included with this soil in mapping are areas of Bergstrom, Branyon, Krum, Roetex, and Smithville soils. The Branyon soil is on terraces, higher on the landscape. The Bergstrom, Krum, and Smithville soils are in higher positions on the landscape. The Roetex soil is in positions similar to those of the Ships soil and are somewhat poorly drained. Also included are soils that have a 6- to 15-inch thick overwash of a light colored loamy material, and soils in depressional areas where the surface layer is black or dark gray. The included soils make up as much as 25 percent of the map unit.

This soil is mainly used for cropland because of its high fertility and slight hazard of erosion. Some areas are used for pasture or rangeland.

Corn, and grain and forage sorghums are the most common crops. Cotton and some kinds of soybeans are also grown. Water ponds on the surface after heavy rains, and in most areas, drainage is needed to remove the excess water. A seedbed is difficult to prepare because of the clayey texture and the slow rate at which the soil dries in the spring. The soil is easily compacted if tilled when wet. The clayey layers form deep, wide cracks when dry. Growing deep-rooted crops helps open up the soil. Leaving crop residue on or near the surface conserves moisture and maintains fertility.

Pasture plants adapted to this soil include improved bermudagrasses, switchgrass, johnsongrass, sweetclover, and vetch. Grazing when the soil is wet causes poor tilth in the surface layer. Effective conservation practices are fertilization, weed control, and controlled grazing.

A few acres are used for rangeland. Originally, this soil was in woodland, but few woodland areas remain.

This soil has potential for wildlife habitat. Areas are inhabited by deer, turkeys, doves, quail, and furbearers. This soil produces many of the forage plants for deer and birds. Waterfowl commonly feed and rest in nearby sloughs and wet depressional areas.

This soil is not suited to most urban and recreational uses because of the hazard of flooding, wetness, very slow permeability, corrosivity to uncoated steel, and the clayey texture. Protection against cave-ins is needed when this soil is excavated.

The soil is in capability subclass 2w and the Clayey Bottomland ecological site.

SrB— Shiro loamy fine sand, 1 to 3 percent slopes

This moderately deep, very gently sloping, sandy soil is on ridgetops and side slopes. The surface is convex. Areas are oblong to elongated in shape. They range from 5 to more than 75 acres in size, averaging 35 acres. Wind erosion has caused some cultivated areas to be weakly mounded.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 3 inches, strongly acid, brown loamy fine sand

Subsurface layer:
3 to 12 inches, strongly acid, pale brown loamy fine sand

Subsoil:
12 to 20 inches, strongly acid, reddish yellow sandy clay that has red and grayish mottles
20 to 32 inches, moderately acid, light brownish gray sandy clay that has yellowish brown mottles
32 to 38 inches, slightly acid, light gray sandy clay that has partly weathered, pale yellow tuffaceous material

Underlying material:
38 to 65 inches, slightly acid, white weakly cemented sandstone that has yellow mottles and thin strata of chalky material

Important soil properties—

Available water capacity: low
Permeability: slow
Drainage: moderately well drained
Runoff: medium
Water table: none within a depth of 6 feet; however, the surface soil is saturated for brief periods following heavy rains
Root zone: moderately deep
Shrink-swell potential: low in the surface layer; high in the subsoil
Hazard of water erosion: moderate
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Rehburg and Singleton soils. The Rehburg soil has a sandy surface layer more than 20 inches thick. It is in positions on the landscape similar to those of the Shiro soil. The Singleton soils are in lower positions. Included in mapping are areas south of the Nechanitz community where the Shiro soil has a gravelly surface layer. Also included are eroded areas of a Shiro soil that has less than 10 inches of the surface layer remaining. The included soils make up less than 20 percent of the map unit.

This soil is used mainly for pasture and rangeland. A few acres are used for cropland.

This soil is suited to forage plants, such as improved bermudagrasses, weeping lovegrass, and bahiagrass. Other adapted plants include arrowleaf

clover, vetch, and kleingrass. The addition of lime and a complete fertilizer, weed control, and controlled grazing are needed for maximum forage production.

Many previously cultivated areas of this soil are used for rangeland. These old cropland fields are now in mid and tall native grasses. Oak trees and yaupon are invading some areas. Continuous overgrazing has caused some areas to degenerate to thick stands of trees and brush and sparse grass. A properly planned grazing system and brush control are needed.

This soil is suited to small grain crops and forage sorghum. It is also suited to cotton, peanuts, and some truck crops. Natural fertility and content of organic matter are low. Water is temporarily perched on the clayey subsoil following heavy rains, but the amount of available water stored is low and plants do not do well in summer. Applications of lime usually are needed in pasture and cropland areas. Controlling soil blowing and water erosion is essential. Residue from crops left on or near the surface helps conserve moisture, slow runoff, reduce soil erosion, and maintain productivity. Alternating tall and short crops in strips and growing cover crops help control soil blowing.

This soil has potential for wildlife habitat. Deer, turkeys, squirrels, doves, and quail inhabit the areas. They feed on yaupon, acorns, forbs, and crop residue. Other small animals and birds feed, nest, and raise their young in these areas. If brush is dense, habitat for most wildlife declines, although deer use the brush for escape and resting cover.

This soil is poorly suited to most urban uses. The main limitations that affect urban uses are the potential for shrinking and swelling of the clayey subsoil with changes in moisture, low strength, depth to bedrock, slow permeability, and corrosivity to uncoated steel. These limitations can be partly overcome with good design and careful installation.

This soil is moderately suited to most recreational uses. The main limitation is depth to bedrock.

This soil is in capability subclass 3e and the Loamy Sand ecological site.

StB—Singleton fine sandy loam, 1 to 3 percent slopes

This moderately deep, very gently sloping, loamy soil is on interstream divides and side slopes. Deep drainageways dissect some areas. The surface is convex. Areas are oblong to irregular in shape. They range from 8 to more than 140 acres in size, averaging 75 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 5 inches, strongly acid, light brownish gray fine sandy loam

Subsurface layer:
5 to 7 inches, strongly acid, light gray fine sandy loam

Subsoil:
7 to 17 inches, very strongly acid, dark brown clay that has yellowish brown mottles
17 to 24 inches, strongly acid, dark brown clay that has grayish brown ped interiors
24 to 33 inches, neutral, light brownish gray and white sandy clay loam that has brownish yellow mottles

Underlying material:
33 to 55 inches, neutral, white weakly cemented tuffaceous sandstone

Important soil properties—

Available water capacity: low
Permeability: very slow
Drainage: moderately well drained
Runoff: medium
Water table: none within a depth of 6 feet; surface is saturated for brief periods following heavy rains
Root zone: moderately deep
Shrink-swell potential: high in the subsoil
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Arol, Rutersville, and Shalba soils. The Arol soil is lower on the landscape. The Rutersville soil is in lower, nearly level positions on the landscape. The Shalba soil is on ridgetops. Also included on higher slopes, is a soil that is similar to the Singleton soil, except that it has a brownish subsoil that contains gray mottles. Included are 1- to 5-acre fields, previously cultivated, that have less than 3 inches of surface layer remaining. The included soils make up less than 15 percent of the map unit.

This soil is used mainly for rangeland and pasture.

Rangeland vegetation generally is a dense stand of post oak trees, juniper, invading yaupon, and other shrubs and brush. Grasses include bluestem, paspalum, and panicum. They are almost shaded out where woody vegetation is dense. In many places, close grazing and trampling reduced the capacity of the soil to absorb water, allowing runoff to increase. Conservation practices, such as controlling brush, reseeding desirable grasses into a prepared seedbed, and controlling grazing can help increase forage yields.

Improved pastures consist mainly of coastal and other improved bermudagrasses. Bahiagrass is planted

or has invaded some areas. Controlling weeds, adding lime, and using a complete fertilizer increases forage production. Controlled grazing practices are needed to maintain adequate stubble height and to help forages maintain vigor.

This soil has potential for wildlife habitat. Areas are inhabited by deer, doves, squirrels, other furbearers, and songbirds. The soil produces adequate food and forage in areas not densely wooded. Controlling brush in strips or patterns increases food supply and allows the growth of tall grasses for turkeys to use as nesting sites.

This soil is poorly suited to most urban uses. The main limitations are the potential for shrinking and swelling with changes in moisture, very slow permeability, corrosivity to uncoated steel and concrete, and depth to bedrock. These limitations can be partly overcome by proper design and careful installation.

This soil is suited to recreational uses. The main limitation is very slow permeability.

This soil is in capability subclass 4e and the Claypan Savannah ecological site.

SvA—Smithville fine sandy loam, 0 to 1 percent slopes

This very deep, nearly level, loamy soil is on low and mid terraces along the Colorado River and its major tributaries. Flooding seldom occurs because of dams; however, in some areas on low terraces, flooding occurs under extreme circumstances. The surface is plane. Areas vary from narrow and elongated to oval in shape. Areas range from 10 to 200 acres in size, averaging 120 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 12 inches, neutral, grayish brown fine sandy loam

Subsoil:
12 to 21 inches, neutral, very dark grayish brown sandy clay loam
21 to 38 inches, neutral, reddish brown sandy clay loam
38 to 49 inches, slightly alkaline, yellowish red sandy clay loam
49 to 75 inches, moderately alkaline, reddish yellow loam

Important soil properties—

Available water capacity: high
Permeability: moderate
Drainage: well drained
Runoff: low
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: low in surface layer, moderate in subsoil
Hazard of water erosion: slight
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Gholson, Bergstrom, and Krum soils. The Gholson soil is higher on the landscape. The Bergstrom and Krum soils are slightly higher and are rarely flooded. Also included is a soil similar to the Smithville soil except it has more clay in the control section. The included soils make up as much as 15 percent of the map unit.

This soil is mainly used for cropland. Some areas are used for pasture or pecan orchards. A few acres are used for rangeland.

Corn, small grain crops,and forage and grain sorghums are the major crops. Cotton, which was once extensively grown, is also planted. Improved pecan varieties are planted in a few areas. The soil is suited to fruit and nut orchards and truck crops. This soil has moderate to high natural fertility and can be worked over a wide range of moisture conditions. Effective conservation practices are leaving crop residue on or near the surface and growing cover crops to help reduce erosion and maintain productivity and tilth. Using a complete fertilizer increases yields and maintains productivity.

Suited pasture grasses are improved bermudagrasses, old world bluestem, kleingrass, arrowleaf clover, and vetch. Fertilizer, weed control, and controlled grazing are needed for maximum forage production.

A few acres are used for rangeland. This soil is suited to range plants, such as big bluestem, indiangrass, little bluestem, switchgrass, and sideoats grama. Forage vigor can be maintained or increased by controlling brush, protecting from burning, and using controlled grazing.

This soil has potential for wildlife habitat. It produces a variety of grasses and forbs; however, little cover and protection is available for deer.

This soil is moderately suited to most urban uses. The limitations that affect urban use are the potential for shrinking and swelling, low strength, slow percolation, seepage, and corrosivity to uncoated steel. These limitations can be partly overcome by good design and careful installation.

This soil is well suited to most recreational uses.

This soil is in capability class 1 and the Loamy Bottomland ecological site.

SwC—Straber loamy fine sand, 2 to 5 percent slopes

This very deep, gently sloping, sandy soil is on

broad convex upland stream divides. The surface is convex. Areas are oval to irregular in shape. They range from 10 to more than 175 acres in size, averaging 150 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 8 inches, moderately acid, pale brown loamy fine sand

Subsurface layer:
8 to 14 inches, moderately acid, very pale brown loamy fine sand

Subsoil:
14 to 24 inches, strongly acid, brownish yellow sandy clay that has light gray and yellowish red mottles
24 to 42 inches, strongly acid, light brownish gray sandy clay that has brownish yellow and strong brown mottles
42 to 59 inches, neutral, light gray sandy clay that has red mottles
59 to 65 inches, slightly alkaline, light gray clay loam
65 to 80 inches, moderately alkaline, pale yellow clay loam

Important soil properties—

Available water capacity: moderate
Permeability: very slow
Drainage: moderately well drained
Runoff: low
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: high in the subsoil
Hazard of water erosion: moderate
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Dubina, Hallettsville, Inez, Lufkin, and Tremona soils. The Dubina and Hallettsville soils are on lower elevations. The Inez and Lufkin soils are on nearly level ridges and in small depressional areas. The Tremona soil is on sandy, higher-lying convex slopes. Also included are narrow gullies as much as 10 feet deep, a previously cultivated and eroded Straber soil that has a 1- to 4-inch thick surface layer remaining, and a few small areas of gravelly Straber soil. The included soils make up less than 15 percent of the map unit.

This soil is used for pasture, rangeland, and cropland.

Improved pasture grasses are mainly coastal and other improved bermudagrasses. Bahiagrass is planted in some areas. Adding lime and a complete fertilizer increases grass production. Weed control and controlled grazing are essential to maintain forage vigor and increase production.

Rangeland vegetation includes bluestem, paspalum, and panicum and thick stands of post oak trees. Yaupon and juniper are common in overgrazed areas. Conservation practices, such as brush control and controlled grazing, help increase forage yields.

Cropland areas are small and scattered; the main crops are corn and forage sorghums. Some areas are planted to small grain crops for winter grazing. Peanuts, melons, and some truck crops are also grown. Natural fertility and content of organic matter are low. The soil is easy to work and is susceptible to wind erosion only when the surface is not protected with crop residue. Effective conservation practices include leaving residue on the surface, planting cover crops, farming on the contour, terracing, and using grassed waterways. These practices help maintain productivity and tilth and reduce wind and water erosion. Fertilizers, including nitrogen, phosphate, and potash, increase crop yields.

This soil has potential for wildlife habitat. Areas are inhabited by deer, doves, turkeys, and squirrels.

This soil is poorly suited to most urban uses. Limitations include the potential for shrinking and swelling with changes in moisture, very slow permeability, seepage, low strength, and corrosivity to uncoated steel and concrete. These limitations can be partly overcome by good design and careful installation.

This soil is moderately suited to most recreational uses. The limitations are very slow permeability and slope.

This soil is in capability subclass 3e and the Loamy Sand ecological site.

SxC—Straber gravelly loamy fine sand, 2 to 5 percent slopes

This very deep, gently sloping, gravelly and sandy soil is on upland stream divides and their side slopes. The surface is convex. Areas are irregular to oblong in shape. They range from 8 to more than 200 acres in size, averaging 120 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 3 inches, moderately acid, pale brown gravelly loamy fine sand

Subsurface layer:
3 to 12 inches, moderately acid, very pale brown gravelly loamy fine sand

Subsoil:
12 to 22 inches, very strongly acid, yellowish brown clay that has light brownish gray mottles
22 to 40 inches, strongly acid, light brownish gray clay that has yellowish red mottles

40 to 49 inches, strongly acid, light gray clay that has yellowish red and brownish yellow mottles
49 to 58 inches, strongly acid, light gray sandy clay loam that has dark red and yellowish red mottles
58 to 72 inches, slightly acid, light gray sandy clay loam that has red mottles

Important soil properties—

Available water capacity: moderate
Permeability: very slow
Drainage: moderately well drained
Runoff: medium
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: low in surface layer, high in subsoil
Hazard of water erosion: moderate
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Tremona gravelly soil. Also included are small areas of a Straber soil that has less than 15 percent gravel in the surface layer and small areas where more than 35 percent gravel is in the surface layer. The included soils make up less than 15 percent of the map unit.

This soil is used mainly for rangeland and pasture. A few acres are used for cropland; however, gravel in the surface layer and low natural fertility restrict this use.

Rangeland vegetation consists of a thick canopy of woody plants and sparsely scattered grasses. In most areas, the choice grasses have been grazed out or the brush and trees have increased to such an extent that most of the grasses are shaded out.

Improved bermudagrasses are the most adapted pasture plants. Other grasses grown are kleingrass, weeping lovegrass, arrowleaf clover, switchgrass, and vetch. Production and plant vigor can be maintained or increased by adding lime and a complete fertilizer, controlling weeds, and controlling grazing.

This soil has potential for wildlife habitat. The areas are inhabited by deer, doves, turkeys, and squirrels. If brush is dense, habitat for most wildlife declines because of scarce forage. Deer use the areas of thick brush for escape and resting cover.

This soil is poorly suited to most urban uses. The limitations include the potential for shrinking and swelling with change in moisture, low strength, very slow permeability, seepage, and corrosivity to uncoated steel and concrete.

This soil is moderately suited to most recreational uses. The limitations are very slow permeability and the gravelly surface layer.

This soil is in capability subclass 3e and the Loamy Sand ecological site.

SxD—Straber gravelly loamy fine sand, 5 to 8 percent slopes

This very deep, moderately sloping, gravelly and sandy soil is on side slopes of ridges. The surface is convex. Areas are oblong in shape and follow the contour of slopes. They range from 10 to 65 acres in size, averaging 40 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 4 inches, moderately acid, brown gravelly loamy fine sand

Subsoil:
4 to 9 inches, very strongly acid, pale brown clay that has red mottles
9 to 28 inches, very strongly acid, pale brown sandy clay that has red mottles
28 to 50 inches, very strongly acid, pale brown sandy clay that has red and gray mottles
50 to 60 inches, strongly acid, light gray sandy clay loam that has pale yellow mottles

Important soil properties—

Available water capacity: moderate
Permeability: very slow
Drainage: moderately well drained
Runoff: high
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: low in surface layer, high in subsoil
Hazard of water erosion: severe
Hazard of wind erosion: slight

Included with this soil in mapping are areas less than 10 acres in size where a Straber soil has less than 15 percent gravel in the surface layer and other areas where more than 35 percent gravel is in the surface layer. Also included are soils underlain by unweathered calcareous loamy or clayey materials at moderate depths. The included soils make up as much as 25 percent of the map unit.

This soil is used for wildlife habitat, rangeland, or pasture. It is not used for cropland because of the gravelly surface layer, low fertility, droughtiness, high surface runoff, and the severe hazard of erosion. In some areas, the gravelly surface has been mined for gravel.

This soil has potential for wildlife habitat. Areas are inhabited by deer, doves, squirrels, and turkeys. Woody plants, forbs, and grasses provide good cover, browse, and seeds for game birds and animals. Turkeys are sparse because tall grasses needed for nesting sites are limited.

Most rangeland has a dense canopy of oak, yaupon, and juniper trees. The understory grasses are mainly shade-tolerant plants and poor quality annuals. Native forage production can be increased by controlling woody vegetation, reseeding, and using controlled grazing.

This soil is suited to improved bermudagrasses, kleingrass, old world bluestem, weeping lovegrass, arrowleaf clover, vetch, and singletary peas. Adding lime and a complete fertilizer increases forage production. Controlling weeds and controlling grazing help maintain plant vigor.

This soil is poorly suited to most urban uses. The limitations are the potential for shrinking and swelling with changes in moisture, low strength, very slow permeability, corrosivity to uncoated steel and concrete, and seepage.

This soil is moderately suited to most recreational uses. The limitations are very slow permeability, slope, and the gravelly surface layer.

This soil is in capability subclass 4e and the Loamy Sand ecological site.

TrB—Tremona loamy sand, 1 to 3 percent slopes

This very deep, very gently sloping, sandy soil is on upland stream divides and side slopes. The surface is convex. Areas are oval to irregular in shape. They range from 20 to more than 100 acres in size, averaging 80 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 9 inches, strongly acid, pale brown loamy sand

Subsurface layer:
9 to 26 inches, strongly acid, very pale brown fine sand

Subsoil:
26 to 34 inches, very strongly acid, light brownish gray clay that has strong brown and yellowish brown mottles
34 to 42 inches, very strongly acid, mottled light brownish gray and brownish yellow sandy clay that has strong brown mottles
42 to 54 inches, moderately acid, mottled light gray, yellowish brown, and strong brown sandy clay
54 to 62 inches, moderately alkaline, light gray sandy clay loam that has strong brown and yellowish red mottles

Underlying material:
62 to 80 inches, neutral, light gray sandy clay loam that has strong brown and yellowish brown mottles

Important soil properties—

Available water capacity: moderate
Permeability: very slow
Drainage: somewhat poorly drained
Runoff: low
Water table: at a depth of 1.5 to 3.5 feet, perched, November to April
Root zone: very deep
Shrink-swell potential: low in surface layer, high in subsoil
Hazard of water erosion: moderate
Hazard of wind erosion: severe

Included with this soil in mapping are small areas of Joiner and Straber soils. The Joiner soil has a thick sandy surface layer more than 40 inches thick and is in lower positions on the landscape. The Straber soil has a sandy surface layer less than 20 inches thick and is in positions similar to those of the Tremona soil. Also included are small areas of a gravelly Tremona soil. The included soils make up less than 15 percent of the map unit.

This soil is used mainly for pasture and rangeland. A few acres are used for cropland.

Pasture plants grown include improved bermudagrasses, lovegrass, arrowleaf clover, and vetch. Adding a complete fertilizer and lime increases forage production. Conservation practices include controlling weeds and using controlled grazing.

The areas used for rangeland consist of post oak and blackjack oak savannahs and mid and tall grasses. Woody plants and brush increase as range deteriorates from continuous overgrazing. Effective conservation practices are controlling brush, reseeding, and using controlled grazing.

This soil is suited to corn, forage sorghums, and small grain crops. It is also suited to peanuts and melons. The thick sandy surface layer is acidic. It readily absorbs water, is easy to work, and is susceptible to wind erosion only when the surface is not protected with crop residue. Effective conservation practices include controlling soil blowing, conserving soil moisture, improving soil fertility, leaving crop residue on or near the surface, growing alternate crops in strips, and using lime and a complete fertilizer.

This soil has potential for wildlife habitat. Areas are inhabited by deer, turkeys, quail, and doves. If brush is dense, habitat for most wildlife declines because of scarce forage. Brush controlled in patterns or strips increases food for wildlife. Deer use the areas of thick brush for escape and resting cover.

This soil is moderately suited to most urban uses. The limitations that affect urban uses are wetness, potential for shrinking and swelling, perched water table, and corrosivity to uncoated steel and concrete. This soil provides poor filtration for septic system absorption fields. Wetness and very slow permeability are other limitations for septic systems. These limitations can be partly overcome by good design and careful installation.

This soil is moderately suited to most recreational uses. The limitations that affect recreational uses are wetness, very slow permeability, and the sandy surface layer.

This soil is in capability subclass 3e and the Sandy ecological site.

Tw—Trinity clay, occasionally flooded

This very deep, nearly level, clayey soil is on flood plains associated with the Colorado River. Flooding occurs about once every 2 to 10 years and generally lasts from several hours to several days. The surface is smooth. Areas are elongated to oval in shape. They range from 20 to more than 200 acres in size, averaging 100 acres. Slopes are 0 to 1 percent.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 5 inches, slightly alkaline, very dark gray clay

Subsurface layer:
5 to 22 inches, slightly alkaline, very dark gray clay

Subsoil:
22 to 47 inches, slightly alkaline, very dark gray clay that has many intersecting slickensides
47 to 67 inches, slightly alkaline, dark gray clay that has many intersecting slickensides
67 to 80 inches, moderately alkaline, gray clay that has many intersecting slickensides

Important soil properties—

Available water capacity: moderate
Permeability: very slow
Drainage: somewhat poorly drained
Runoff: low
Water table: none within a depth of 6 feet
Root zone: very deep
Shrink-swell potential: very high
Hazard of water erosion: slight
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Ships, Pursley, and Ganado soils. The loamy Pursley soil is on major streams that drain into the Colorado River. The clayey Ganado and Ships soils are higher on the landscape. Also included is a Trinity soil in which there is as much as 10 inches of brown loamy overwash and some small areas of soil that are frequently flooded. The included soils make up less than 15 percent of the map unit.

This soil is mainly used for cropland. Some areas are used for pasture and rangeland.

This soil is suited to corn, cotton, grain sorgham, forage sorghum, and soybeans. Water ponds on the surface after heavy rains. Some areas require surface drainage. Seedbed preparation is difficult because of the clayey texture and the slow rate at which the soil dries in the spring. The soil is easily compacted if tilled when wet. The clayey layers form deep, wide cracks when dry. Growing deep-rooted crops helps to open and aerate the soil. Leaving crop residue on or near the surface helps conserve moisture and maintain fertility.

Pasture plants adapted to this soil include improved bermudagrasses, johnsongrass, gordo bluestem, switchgrass, sweetclover, and old world bluestem. Grazing when soil conditions are wet causes poor tilth in the surface layer. Effective conservation practices are fertilization, weed control, and controlled grazing.

A few acres of this soil are used for rangeland. Most of these areas are wooded.

This soil has potential for wildlife habitat. Waterfowl, doves, quail, deer, squirrels, and furbearers inhabit the areas. The soil produces many forage plants. Small grain crops provide winter grazing for deer. Adequate resting, nesting, and escape cover is provided in the wooded areas. Shallow water areas can be developed for waterfowl.

This soil is not suited to most urban uses. The main limitations are the hazard of flooding, very slow permeability, and clayey surface layer. Protection against cave-ins is needed when this soil is excavated.

This soil is not suited to most recreational uses. The limitations are the hazard of flooding, high content of clay, and very slow permeability.

This soil is in capability subclass 2w and the Clayey Bottomland ecological site.

Uf—Uhland clay loam, frequently flooded

This very deep, nearly level, loamy soil is on flood plains. Flooding occurs for brief periods about 5 to 7 times every 10 years. Alluvial deposits commonly alter or add to the texture because of the frequent flooding. The surface is smooth. Areas are long and narrow and commonly occupy the entire flood plain of the smaller streams. These areas range from 40 to more than 300 acres in size, averaging 200 acres. Slopes are 0 to 1 percent.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 6 inches; neutral, dark grayish brown clay loam

Underlying material:
6 to 11 inches, neutral, brown sandy clay loam

11 to 45 inches, neutral, yellowish brown fine sandy loam that has brownish and grayish mottles
45 to 58 inches, slightly acid, grayish brown loam that has yellowish brown mottles
58 to 80 inches, neutral, light brownish gray fine sandy loam

Important soil properties—

Available water capacity: moderate
Permeability: moderately slow
Drainage: moderately well drained
Runoff: low
Water table: at a depth of 1.5 to 3.0 feet, apparent, December to May
Root zone: very deep
Shrink-swell potential: low
Hazard of water erosion: severe
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Navidad and Warda soils. The Navidad soil is on ridges, slightly higher on the landscape than the Uhland soil. The Warda soil is in depressional areas and also in slightly higher areas that are occasionally flooded. Also included is a soil similar to the Uhland soil, except it is calcareous throughout the soil profile. The included soils make up as much as 20 percent of the map unit.

This soil is used mainly for pasture and rangeland. A few acres are farmed where flooding is not frequent.

This soil is planted mainly to pasture forages. Pasture plants include improved bermudagrasses, kleingrass, switchgrass, old world bluestem, arrowleaf clover, vetch, and singletary peas. Pecan trees are commonly managed along with the pasture grasses.

Well managed rangeland areas consist of mid and tall grasses and a scattering of pecan, elm, oak, hackberry, and box elder trees. Most of the areas have been continuously overgrazed and the desirable tall grasses have been grazed out. Less desirable grasses have increased along with brushy plants. As heavy grazing continues, brush and trees increase and grass decreases. Pine trees grow in a few areas and the soil is suited to this use.

This soil is not suited to cropland because of frequent flooding. Peanuts and forage sorghums are planted because of their high yield potential after the main danger from spring flooding has ended. However, damage from flooding does occur.

This soil has potential for wildlife habitat. Areas are inhabited by deer, turkeys, squirrels, doves, quail, and furbearers. Turkeys use the large trees for roosting. This soil produces many of the forage plants for deer and turkeys. Adequate nesting and resting places and escape cover are also provided.

This soil is not suited to urban and most recreational uses because of the hazard of flooding.

This soil is in capability subclass 5w and the Loamy Bottomland ecological site.

US—Ustorthents, sandy

This map unit consists of very gently sloping, sandy soils that have been reclaimed after being mined for sand and gravel. They are on the terraces of the Colorado River. After smoothing and leveling, they are 1 to 5 feet lower in elevation than the surrounding landscape. Areas are irregular in shape. They range from 5 to 80 acres in size, averaging 50 acres. Slopes range from 1 to 3 percent.

Mining operations have removed 5 to 20 feet of the soil material. In most areas, none of the original soil remains. The current soil material is extremely variable. It is commonly sand, fine sand, or fine sandy loam with varying amounts of sand, silt, clay, or gravel. The soil material generally is moderately alkaline and calcareous.

Included with this soil in mapping are small areas of Branyon, Burleson, Dutek, Gholson, and Smithville soils. Also included are some areas of soil not reclaimed as well as small and large pits filled with water. The included soils make up less than 20 percent of the map unit.

This soil is used mainly for pasture. Some areas are used for rangeland.

Areas that have been smoothed and leveled are planted to improved bermudagrasses, weeping lovegrass, kleingrass, switchgrass, vetch, and singletary peas.

Native vegetation consists of mid and tall grasses. Other plants adapted to these reclaimed areas are legumes, Maximillian sunflower, and Illinois bundleflower.

This soil has potential for wildlife habitat. Doves, quail, and songbirds are common. Deer move through the areas. Tall grasses provide nesting areas for turkeys. Waterfowl use water areas for resting and feeding.

Ustorthents, sandy, are in capability subclass 3e and the Sandy Bottomland ecological site.

Wa—Warda very fine sandy loam, occasionally flooded

This very deep, nearly level, loamy soil is on flood plains of streams that drain from sandy and loamy areas. Flooding occurs for short periods about once every 3 to 20 years. The surface is plane to weakly concave. Areas are oblong in shape. They range from

12 to more than 60 acres in size, averaging 60 acres. Slopes are 0 to 1 percent.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 8 inches, moderately acid, grayish brown very fine sandy loam

Subsurface layer:
8 to 15 inches, slightly acid, dark grayish brown very fine sandy loam

Subsoil:
15 to 26 inches, strongly acid, dark grayish brown sandy clay loam
26 to 31 inches, moderately acid, very dark grayish brown sandy clay loam
31 to 38 inches, moderately acid, very dark grayish brown sandy clay loam that has dark yellowish brown mottles
38 to 56 inches, slightly acid, dark grayish brown sandy clay loam that has yellowish brown mottles
56 to 64 inches, strongly acid, dark grayish brown fine sandy loam that has yellowish brown mottles
64 to 80 inches, strongly acid, brown fine sandy loam that has yellowish brown mottles

Important soil properties—

Available water capacity: high
Permeability: moderate
Drainage: moderately well drained
Runoff: negligible
Water table: at a depth of 3.7 to 6.0 feet, apparent, November to April
Root zone: very deep
Shrink-swell potential: low in surface layer, moderate in subsoil
Hazard of water erosion: slight
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Navidad and Uhland soils. The Navidad soil is on low ridges and terraces. The Uhland soil is near stream channels. Also included are low-lying drainage areas that are frequently flooded and small depressional areas where water ponds for short periods. The included soils make up less than 20 percent of the map unit.

This soil is used for pasture and cropland. Some areas have scattered native pecan trees. Improved varieties of pecans are also grown. This soil has good fertility and stores high amounts of available water.

This soil is suited to forage sorghums, peanuts, and corn. It is also suited to grain sorghum, small grain crops, melons, small fruits, truck crops, and cotton. Leaving crop residue on or near the surface helps conserve soil moisture, maintain soil tilth, and reduce surface crusting. Plowing when the soil is wet causes compaction below the tillage zone. The compaction reduces leaching of harmful salts. Growing legumes, such as sweetclover, vetch, and winter peas help reduce compaction and maintain tilth and fertility.

This soil is suited to improved bermudagrass, switchgrass, old world bluestem, kleingrass, arrowleaf clover, and white clover. Effective conservation practices are controlling weeds, using a complete fertilizer, and controlling grazing to maintain adequate stubble height.

This soil has potential for wildlife habitat. Deer, turkeys, and other birds inhabit the areas. In places, small, wet depressional areas provide food and resting areas for waterfowl.

This soil is not suited to urban uses mainly because of the hazard of flooding.

This soil is moderately suited to most recreational uses. The main limitation is the hazard of flooding.

This soil is in capability subclass 2w and the Loamy Bottomland ecological site.

We—Weswood loam, occasionally flooded

This very deep, nearly level, loamy soil is on flood plains of the Colorado River. On the average, flooding occurs about once every 10 to 20 years and generally lasts less than 2 days. The surface is smooth and gently undulating. Areas are elongated to oval in shape. They range from 5 to more than 100 acres in size, averaging 90 acres. Slopes are 0 to 1 percent.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 17 inches, moderately alkaline, brown loam

Subsoil:
17 to 31 inches, moderately alkaline, brown, silt loam
31 to 42 inches, moderately alkaline, light brown silt loam

Underlying material:
42 to 80 inches, moderately alkaline, brown silt loam

Important soil properties—

Available water capacity: high
Permeability: moderate
Drainage: well drained
Runoff: low
Water table: none within a depth of 6 feet; occasional flooding occurs
Root zone: very deep
Shrink-swell potential: low

Hazard of water erosion: slight
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Coarsewood and Gad soils. The Coarsewood soil is lower on the landscape. The sandy Gad soil is adjacent to the river channel and is frequently flooded. Also included are areas where overwash material of a light colored silt loam is less than 8 inches thick. The included soils make up less than 20 percent of the map unit.

This soil is used mainly for cropland and improved pastures.

A few acres are used for rangeland.

The main crops are pecans, corn, peanuts, and forage and grain sorghums (fig. 17). For many years, this soil was planted to cotton. It is suited to truck crops. It is easily tilled under a wide range of moisture conditions; however, tilling when wet causes severe soil compaction. Fertility and production can be maintained by leaving crop residue on or near the surface and by growing legumes.

Adapted pasture grasses include improved bermudagrasses, gordo and old world bluestem, indiangrass, johnsongrass, kleingrass, weeping lovegrass, and vetch. Production and vigor are increased by applying essential fertilizers. Controlling weeds and using controlled grazing help increase production.

The rangeland vegetation consists of mid and tall native grasses and an overstory of oak, ash, pecan, hackberry, and elm trees. Heavy and continuous grazing causes a dense overstory that shades out the grass.

This soil has potential for wildlife habitat. Areas are inhabited by deer, doves, quail, and furbearers. The soil is suited to growing forage plants for wildlife.

This soil is not suited to most urban uses. The hazard of flooding is the main limitation.

This soil is well suited to most recreational uses; however, flooding is a hazard that affects camp areas.

This soil is in capability subclass 2w and the Loamy Bottomland ecological site.

WsA—Wilson clay loam, 0 to 1 percent slopes

This very deep, nearly level, loamy soil is on smooth, ancient terraces and slightly depressional residual uplands. Areas are irregular to oblong in shape. They range from 5 to more than 200 acres in size, averaging 150 acres.

Figure 17.—Peanuts are grown for local markets on Weswood loam, occasionally flooded.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:

0 to 4 inches, moderately acid, dark grayish brown clay loam

4 to 10 inches, moderately acid, dark gray clay loam

Subsoil:

10 to 28 inches, slightly acid, dark gray silty clay that has pressure faces

28 to 51 inches, slightly acid, gray silty clay

51 to 69 inches, neutral, gray silty clay

69 to 80 inches, neutral, light gray silty clay that has brownish yellow mottles

Important soil properties—

Available water capacity: moderate
Permeability: very slow
Drainage: moderately well drained
Runoff: low
Water table: none within a depth of 6 feet; surface is saturated for brief periods after heavy rains
Root zone: very deep
Shrink-swell potential: moderate in surface layer, high in subsoil
Hazard of water erosion: slight
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Burleson and Lufkin soils. The clayey Burleson soil is in positions on the landscape similar to those of the Wilson soil. The Lufkin soil is in lower positions. Also included in similar positions is a soil that has a dark colored, fine sandy loam surface layer. The included soils make up less than 15 percent of the map unit.

This soil is used mainly for cropland, pasture, and rangeland.

This soil is suited to corn, grain and forage sorghums, and small grain crops. It was once intensely cultivated to cotton. Effective conservation practices are conserving moisture, improving tilth, and maintaining fertility. Surface drainage is needed in a few areas. Planting crops that produce large amounts of residue and leaving the residue on or near the surface help conserve moisture, reduce crusting, and improve tilth.

Adapted pasture grasses include improved bermudagrasses, old world bluestem, arrowleaf clover, and singletary peas. An adequate seedbed is difficult to prepare because of soil crusting and rapid changes in surface moisture conditions. Grazing when wet causes soil compaction. Maximum pasture production requires fertilization, weed control, and controlled grazing.

This soil is suited to rangeland. The climax vegetation is a mixture of short to tall grasses and a few scattered elm, oak, and hackberry trees. Mesquite, yaupon, and honey locust invade as the range deteriorates. Effective conservation practices are brush control, reseeding, and controlled grazing.

This soil has potential for wildlife habitat. Deer, quail, doves, and turkeys inhabit the areas. Native trees, forbs, and grasses provide seed for game birds and animals. Adjacent cropland provides additional forage.

This soil is poorly suited to most urban uses. The limitations are the potential for shrinking and swelling with changes in moisture, corrosivity to uncoated steel, very slow permeability, low strength, and a clayey subsoil. These limitations can be partly overcome by good design and careful installation.

This soil is poorly suited to recreational uses. Very slow permeability is a limitation.

This soil is in capability subclass 3w and the Claypan Prairie ecological site.

WwC—Winedale gravelly fine sandy loam, 2 to 5 percent slopes

This moderately deep, gently sloping, loamy soil occupies interstream divide ridges, side slopes, and footslopes. Deep drainageways commonly dissect the side slopes and footslopes. The surface is convex. Areas are irregular to elongated in shape. Soil areas range from 15 to more than 200 acres in size, averaging 120 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:

0 to 7 inches, very strongly acid, brown gravelly fine sandy loam

Subsoil:

7 to 14 inches, extremely acid, yellowish red clay

14 to 23 inches, extremely acid, brown clay

23 to 37 inches, extremely acid, light yellowish brown clay

Underlying material:

37 to 51 inches, extremely acid, light yellowish brown clay that contains 40 percent weakly consolidated mudstone fragments

51 to 80 inches, extremely acid, very pale brown clay that contains 40 percent weakly consolidated mudstone fragments

Important soil properties—

Available water capacity: moderate
Permeability: very slow
Drainage: moderately well drained
Runoff: very high
Water table: none within a depth of 6 feet
Root zone: moderately deep
Shrink-swell potential: very high

Hazard of water erosion: moderate
Hazard of wind erosion: moderate

Included with this soil in mapping are small areas of Burlewash, Singleton, and Shiro soils. The Burlewash soil is in positions on the landscape similar to those of the Winedale soil. The Singleton soil is in slightly lower positions. The Shiro soil has a sandy surface layer. It is slightly lower on the landscape. The included soils make up less than 15 percent of the map unit.

This soil is used mainly for forest rangeland and pasture. A few acres are used for cropland.

Forest rangeland consists mainly of loblolly pine. Mixed hardwoods are scattered throughout the areas. Native understory vegetation consists of mid and tall grasses. The soil has potential for timber production when timber management practices are used.

Adapted pasture plants include improved bermudagrasses, kleingrass, lovegrass, arrowleaf clover, and singletary peas. Moderate available water capacity and acidic soil conditions are limitations for the use of this soil as pasture. Effective conservation practices include controlling weeds, adding lime and a complete fertilizer, and controlling grazing.

A few acres of this soil are planted to small grain crops, peanuts, and forage sorghums. The high acidity in the upper part of the subsoil affects some plants. Terraces are needed to help reduce erosion and slow runoff.

This soil has potential for wildlife habitat. Deer, doves, turkeys, and other gamebirds inhabit the areas. A variety of native forbs, bushes, and grasses are adapted to this soil.

This soil is poorly suited to most urban uses. The main limitations are the potential for shrinking and swelling of the subsoil with changes in moisture, corrosivity to uncoated steel and concrete, low strength, very slow permeability, clayey subsoil, and gravelly surface layer. These limitations can be partly overcome by good design and careful installation.

This soil is moderately suited to most recreational uses. The gravel in the surface layer and very slow permeability are limitations.

This soil is in capability subclass 4e and the Claypan Savannah ecological site.

ZkB—Zack very fine sandy loam, 1 to 3 percent slopes

This moderately deep, very gently sloping, loamy soil is on convex uplands. Areas are irregular to oblong in shape. They range from 10 to more than 200 acres in size, averaging 130 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 6 inches, slightly acid, grayish brown very fine sandy loam

Subsoil:
6 to 14 inches, slightly acid, brown clay that has yellowish red mottles
14 to 24 inches, neutral, reddish brown clay that has pale brown mottles
24 to 34 inches, neutral, yellowish brown clay that has few concretions of calcium carbonate
34 to 38 inches, neutral, mottled very pale brown and brownish yellow sandy clay loam that has strong brown mottles

Underlying material:
38 to 72 inches, neutral light gray loam that has yellow and brownish yellow mottles and few fragments of sandstone

Important soil properties—

Available water capacity: moderate
Permeability: very slow
Drainage: moderately well drained
Runoff: medium
Water table: none within a depth of 6 feet
Root zone: deep
Shrink-swell potential: high in the subsoil
Hazard of water erosion: moderate
Hazard of wind erosion: moderate

Included with this soil in mapping are areas of the Gredge soil in positions on the landscape similar to those of the Zack soil. Also included are small areas of eroded Zack soil. Erosion has removed most of the surface layer of the previously cultivated areas and deep, uncrossable gullies are common. The included soils make up less than 15 percent of the map unit.

Most of this soil is used for rangeland and pasture. A few acres are used for cropland.

The native vegetation is a mixture of mid and tall grasses and scattered post oak trees. Much of the rangeland is old cropland fields that were never seeded to quality native grasses after cultivation ended. The rangeland now consists of mostly poor quality grasses, mesquite, and scattered post oak trees. Forage production can be increased in some areas by seeding desirable native grasses into a prepared seedbed. Controlled grazing can help maintain forage vigor and increase production.

This soil is suited to pasture plants, such as improved bermudagrasses, old world bluestem, kleingrass, weeping lovegrass, singletary peas, and arrowleaf clover. Effective conservation practices are fertilization, weed control, and controlled grazing to maintain adequate stubble height.

This soil is suited to cropland. Crops that mature during the cool season are best adapted. Fertility is low and areas left bare are subject to erosion. Terracing and farming on the contour help slow runoff, thereby reducing water erosion. Leaving crop residue on the surface helps control soil blowing and conserves moisture. Planting cool-season legumes helps improve tilth, fertility, and reduce erosion.

This soil has potential for wildlife habitat. Areas are inhabited by doves, quail, squirrels, and deer. Woody plants, forbs, and grasses provide cover, browse, and seeds for game birds and animals.

This soil is moderately suited to most urban uses. Low strength, the potential for shrinking and swelling with changes in moisture, and corrosivity to uncoated steel are the main limitations. Septic tank absorption fields are not suited to this soil because of the very slow permeability. These limitations can be partly overcome by good design and careful installation.

This soil is moderately suited to most recreational uses. The main limitation is very slow permeability.

This soil is in capability subclass 3s and the Claypan Prairie ecological site.

ZkC—Zack gravelly fine sandy loam, 2 to 5 percent slopes

This moderately deep, gently sloping, loamy and gravelly soil is on convex uplands. Rounded siliceous gravel makes up 15 to 35 percent of the loamy surface layer. Areas are elongated to oblong in shape. They range from 8 to more than 150 acres in size, averaging 90 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 10 inches, moderately acid, brown gravelly fine sandy loam

Subsoil:
10 to 22 inches, moderately acid, reddish brown clay that has gray and red mottles
22 to 28 inches,moderately acid, yellowish red sandy clay that has brown mottles
28 to 31 inches, neutral, yellowish brown sandy clay loam that has brown mottles

Underlying material:
38 to 46 inches, neutral, light brownish gray sandy clay loam that has brown mottles
46 to 50 inches, neutral, light brownish gray sandy clay loam that has light yellowish brown, thin beds of shale
50 to 72 inches, neutral, light brownish gray clay loam that has thin strata of brownish yellow ironstone

Important soil properties—

Available water capacity: moderate
Permeability: very slow
Drainage: moderately well drained
Runoff: medium
Water table: none within a depth of 6 feet
Root zone: deep
Shrink-swell potential: low in surface layer, high in subsoil
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with this0 soil in mapping are small areas of Chazos, Edge, and Gredge soils. The sandy Chazos soil is slightly higher on the landscape. The Edge soil is on steep side slopes. The Gredge soil is in positions similar to those of the Zack soil. Also included are small areas of Zack soil that has less than 15 percent gravel in the surface layer and areas that have more than 35 percent gravel in the surface layer. The included soils make up less than 20 percent of the map unit.

This soil is used for rangeland and pasture. It is not used for cropland.

Areas used for rangeland consist of mid and tall grasses and various amounts of juniper, oak, and yaupon. In areas where grazing has been heavy and continuous, oak, elm, juniper, yaupon, haws, and other brush have become dense. Mesquite is invading some areas. Effective conservation practices include brush control and controlled grazing.

Improved bermudagrasses, kleingrass, bahiagrass, and weeping lovegrass are managed for pasture and hay. Other adapted pasture plants include old world bluestem, arrowleaf clover, and vetch. Controlled grazing helps maintain adequate stubble height. In some areas, adding lime and a complete fertilizer can increase grass production.

This soil has potential for wildlife habitat. Deer, squirrels, doves, and quail inhabit the areas. Woody plants, forbs, and grasses provide good cover, browse, and seeds for game birds and animals.

This soil is moderately suited to most urban uses. The limitations are the potential for shrinking and swelling with changes in moisture, low strength, and corrosivity to uncoated steel. Septic tank absorption fields are not suited to this soil because of very slow permeability. These limitations can be partly overcome by good design and careful installation.

This soil is moderately suited to most recreational uses. The gravelly surface layer and very slow permeability are limitations.

This soil is in capability subclass 4e and the Claypan Prairie ecological site.

ZuA—Zulch fine sandy loam, 0 to 2 percent slopes

This moderately deep, nearly level, loamy soil is on uplands. The surface is plane to slightly convex. Areas range from 5 to more than 50 acres in size, averaging 35 acres.

The typical sequence, depth, and composition of the layers of this soil are—

Surface layer:
0 to 5 inches, slightly acid, dark grayish brown fine sandy loam that has yellowish brown mottles

Subsoil:
5 to 28 inches, neutral, very dark gray clay
28 to 39 inches, slightly alkaline, dark grayish brown clay loam

Underlying material:
39 to 48 inches, slightly alkaline, grayish brown clay loam that has dark gray mottles
48 to 58 inches, neutral, light brownish gray weakly consolidated siltstone interbedded with thin strata of brownish yellow and light gray weakly cemented sandy and loamy material

Important soil properties—

Available water capacity: moderate
Permeability: very slow
Drainage: moderately well drained
Runoff: very low
Water table: none within a depth of 6 feet; however, the surface is saturated for brief periods following heavy rains
Root zone: moderately deep
Shrink-swell potential: low in surface layer, high in subsoil
Hazard of water erosion: moderate
Hazard of wind erosion: slight

Included with this soil in mapping are small areas of Gredge, Inez, and Zack soils. The Gredge and Zack soils are slightly higher on the landscape. The Inez soil is on footslopes along drainageways. The included soils make up less than 15 percent of the map unit.

This soil is used mostly for rangeland. Some areas are used for pasture and cropland.

The climax plant community is a mixture of tall and mid grasses and an overstory of scattered oak, elm, and hackberry trees. Excessive grazing over prolonged periods increases woody underbrush and decreases the herbaceous understory. Areas that were once cultivated fields have been invaded by mesquite and native grasses and forbs. Effective conservation practices include brush control, reseeding, and controlled grazing.

Adapted pasture grasses include improved bermudagrasses, clover, and vetch. Effective conservation practices include fertilization, weed control, and controlled grazing.

This soil is suited to forage sorghums and small grain crops. Effective conservation practices include improving tilth and maintaining fertility.

This soil has potential for wildlife habitat. Deer, turkeys, doves, and game birds inhabit the area. Many of the grasses, forbs, and other woody plants provide food, resting, and escape cover. Tall grasses make adequate resting and nesting sites for turkeys.

This soil is poorly suited to most urban uses. The main limitations are the potential for shrinking and swelling with changes in moisture, corrosivity to uncoated steel, and very slow permeability that affects septic tank absorption fields.

This soil is moderately suited to most recreational uses. Very slow permeability is a limitation.

This soil is in capability subclass 3e and the Claypan Prairie ecological site.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

General management needed for crops and pasture is suggested in this section. The system of land capability classification used by the Natural Resources Conservation Service is explained and prime farmland is described.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading “Detailed Soil Map Units.” Specific information can be obtained from the local office of the Natural Resources Conservation Service or the Texas Cooperative Extension Service.

More than 200,000 acres in the county was used for cropland in the late 1950’s. The acres of land planted to crops has been steadily declining as more acres are being converted to pasture. At present, about 72,000 acres of cropland is being farmed to annual crops.

Some soils in Fayette County have a high potential for crop production. These include the dark, loamy and clayey soils and dark, clayey soils on uplands and upland stream terraces and bottom lands along the Colorado and Navidad Rivers (fig. 18). Much of the rest of the county has medium to low potential for cropland because of the sloping topography that increases the hazard of erosion when farming without conservation practices.

Soil erosion is a major concern on both cropland and pasture in Fayette County. When slopes exceed 2 percent, erosion becomes a hazard; however, slopes as much as 8 percent can be farmed with proper treatment.

Loss of the surface layer of soil, or topsoil, is damaging. Crop yields are reduced as the topsoil is lost and subsoil is mixed into the plow layer. The most severe damage occurs on soils that have a clayey subsoil. On many sloping fields, tillage or seedbed preparation is difficult in clayey or hardpan areas where the topsoil has been lost to erosion. Another damaging effect of soil erosion is that sediment moves into streams and other bodies of water. Reducing soil erosion minimizes water pollution caused by sediment and improves water quality for municipal use, recreation, and fish and wildlife habitat.

Practices that reduce erosion provide a protective surface cover, reduce runoff, and increase infiltration. Cropping systems that keep a plant cover on the soil for extended periods can limit soil losses to levels that

Figure 18.—Harveting corn on Krum silty clay, rarely flooded.

do not damage the productive capacity of the soils. On livestock farms, grasses and legumes provide nitrogen and improve tilth when used as part of a cropping system. Terraces and diversions reduce the length of slopes which, in turn, reduce the amount of runoff and soil erosion. Some soils may not be suitable for terraces and diversions because of irregular topography, wetness in terrace channels, or the presence of bedrock at a depth of less than 40 inches.

Information on designing measures to reduce erosion for each soil type is available from the local office of the Natural Resources Conservation Service.

Terraced and bottom land soils used for cropland and pasture need surface drainage. Wetness causes lower crop and forage production.

Soil fertility is naturally low in most upland soils in Fayette County. Soils on terraces and bottom lands are alkaline and are naturally higher in plant nutrients than most upland soils. Adding organic matter and fertilizer to most upland soils improves their productive capabilities.

The soils on upland savannahs are acid in their natural state. Applications of lime can be necessary to raise the pH level sufficiently for good growth of grasses and other crops. On all soils, lime and fertilizer applications should be based on the results of a recent soil test, the needs of the crop, and the expected yield. The Texas Cooperative Extension Service can help determine the kinds and amounts of fertilizer and lime to apply.

Soil tilth is important for seed germination and water infiltration into the soil. Soils that have good tilth are granular and porous.

Most soils in the county have a surface that is light in color and low in content of organic matter. Generally, the structure of such soils is weak. Intense rainfall causes the surface to crust. It becomes hard and impervious to water when dry. Once the crust forms, it reduces infiltration and increases runoff. Regularly adding crop residue, manure, or other organic matter can help improve soil structure and reduce surface crust formation.

Pasture is important in Fayette County because raising livestock is the major farm enterprise. For the past several years, the trend has been to convert land from cropland to pasture and hayland. Land used for pasture and hay is planted to introduced grasses that respond to good management. Among the important grasses are coastal bermudagrass, common bermudagrass, kleingrass, Wilman lovegrass, gordo bluestem, and medio bluestem. Hayland consists of improved varieties of bermudagrass and introduced forage sorghums. This pasture and hayland is used mainly in combination with temporary pastures, such as small grain crops, to provide year-round grazing.

Improved varieties of bermudagrass, such as coastal bermudagrass, are best adapted to deep soils. However, they are adapted to most soils where a good seedbed can be prepared. Kleingrass and gordo or medio bluestem are best grown in clayey alkaline soils. Wilman lovegrass is better adapted to coarse-textured soils as well as some medium-textured soils.

Effective conservation practices for pasture management include fertilization, rotational grazing to maintain plant vigor, and weed and brush management. A few soils in the northern part of the county need lime. Effective conservation practices for hayland include fertilizing and harvesting forage at the proper stage of growth.

Latest information and suggestions on producing pasture and hay can be obtained from local offices of the Texas Cooperative Extension Service and the Natural Resources Conservation Service.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forest land, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. The slope ranges mainly from 0 to 5 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

Each year, thousands of acres of land throughout the United States are converted from agricultural to nonagricultural uses. Some of this land is prime farmland. Although prime farmland is the best land for farming, in many areas it is also the land most likely to be converted. This is because most settlements were in the center of the most fertile areas and near rivers that offered a source of water and transportation.

Most areas of prime farmland in Fayette County consist of very deep, nearly level to gently sloping, fertile soils. The highest yields of crops and forage in the county are produced on these soils.

Nearly 36 percent, or about 220,239 acres of the soils in Fayette County are prime farmland. They are throughout the county, but most are within the Frelsburg-Carbengle, Hallettsville-Straber-Dubina, Wilson-Branyon-Ships, Gholson-Smithville-Dutek, and Coarsewood-Gad-Bergstrom general soil map units. Most areas of these soils are used for cultivated crops, improved pasture, or rangeland.

The map units in the survey area that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good-quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Texas Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by numerals 1 through 8. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class 1 soils have few limitations that restrict their use.

Class 2 soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class 3 soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class 5 soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class 6 soils have severe limitations that make them generally unsuitable for cultivation.

Class 7 soils have very severe limitations that make them unsuitable for cultivation.

Class 8 soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c*, to the class numeral, for example, 2e. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class 1 there are no subclasses because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by *w, s,* or *c* because the soils in class 5 are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, 2e-4 and 3e-6.

The capability classification of each map unit is given in the section “Detailed Soil Map Units” and in table 6.

Rangeland

Homer Sanchez, State Range Conservationist, Natural Resources Conservation Service, Temple, Texas, helped prepare parts of this section.

Rangeland is defined as land on which the native vegetation (the climax plant community) is

predominantly grasses, grass-like plants, forbs, and shrubs. Rangeland receives no regular or frequent cultural treatment. The composition and production of the plant community are determined by soil, climate, and topography.

About 176,487 acres or 29 percent of Fayette County is classified as rangeland. The rangeland in Fayette County is located within two Major Land Resource Areas (MLRAs), the Southern Blackland Prairie MLRA and the Southern Claypan Area MLRA.

The two MLRAs divide the county in half—southwest to northeast. The Southern Claypan Area, which makes up about 41 percent of Fayette County, is in the northern half. The Southern Blackland Prairie is mainly along the southern half of the county. Claypan soils are typically overlain by sandy and loamy surface layers. Blackland soils are mainly darker in color and much higher in clay content.

Southern Claypan Area. Loamy and sandy soils are typical of this part of Fayette County. About 50 percent of the the Southern Claypan area is in rangeland and 25 percent is in improved pasture. The rest is in cropland and woodland. The climax plant community generally is a post oak or blackjack oak savannah. In a climax community, trees shade as much as 15 to 20 percent of the ground on uplands. Large trees, such as oaks, American elm, and hackberry, form dense overstory along major drainageways. Mid to tall grasses dominate the understory. As retrogression or deterioration occurs, woody plants invade and tall grasses are replaced by mid to short grasses and forbs that are less productive and less nutritious to livestock.

Southern Blackland Prairie. This part of Fayette County has mostly clayey soils that can potentially support a climax plant community that is dominantly a tall grass prairie. In the past, these areas maintained a tall grass mixture, such as big bluestem, little bluestem, switchgrass, indiangrass, Virginia wildrye, and some Eastern gamagrass. In a climax community, midgrasses are sideoats grama, tall dropseed, and Texas wintergrass, and interspersed areas of trees frequently along major drainageways and occasionally in motts.

Few ranchers in Fayette County depend exclusively on rangeland to feed livestock. Although range vegetation often contributes significant amounts of forage during winter months, it is supplemented by protein concentrates and small grain pastures. True native vegetation in most of the county is in small blocks of less than 100 acres. Forage productivity has been depleted in most areas because of improper grazing management and invasion of woody or weedy vegetation, or both, that reduce the quality and quantity of suitable forage plants. Much of the acreage listed as rangeland is land that is abandoned cropland or pasture. Because these lands have not been managed properly, they generally produce less than half of their original potential. Most of the rangeland is in poor to fair condition. Some of the dominant grasses are Texas wintergrass, sideoats grama, windmillgrass species, threeawn, little bluestem, and some introduced species, such as KR bluestem, which have invaded or survived prior management. Paspalum species dominate many sites in the Southern Claypan area.

Rangelands are assigned to *ecological sites* which are sometimes called *range sites*. An ecological site for rangeland is a distinctive kind of land with specific physical characteristics that makes it different from other kinds of land in its ability to produce a distinctive kind and amount of vegetation. Many different rangeland ecological sites may occur in the soil survey area. Over historical time, the combination of plants best suited to a particular soil and climate became dominant. If the soil is not excessively disturbed, this group of plants is the historic climax plant community for the site. Historic climax plant communities are not static but vary slightly from year to year and place to place.

The relationship between soils and vegetation was ascertained during this survey; thus, rangeland ecological sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of plants. Soil reaction, salt content, and a seasonal high water table are also important. The “Electronic Field Office Technical Guide,” which is available on line at www.nrcs.usda.gov or at any office of the Natural Resources Conservation Service, can provide specific information about ecological sites.

Nearly all plant communities have undergone changes over time. Many years of continuous livestock grazing, the absence of fire, the invasion of plants that were not originally in the plant community, and climatic events, such as major droughts, have all interacted to affect changes in the vegetation on rangeland.

Abnormal disturbances that change the historic climax plant community include repeated overuse by livestock, excessive burning, erosion, and plowing. Grazing animals select the most palatable plants. These plants will eventually die if they are continually grazed at a severity that does not allow for recovery. Under these conditions, less desirable plants, such as annuals and weed-like plants can increase. Usually, these degradation processes take place over many years. If the plant community and soils have not degraded significantly, high quality native plants may return with proper grazing management.

The Natural Resources Conservation Service and other land management agencies assist landowners to identify problems and concerns, as well as opportunities

to maintain or improve their rangeland resources. A rangeland ecological site may be evaluated by three distinct methods: *similarity index*, *rangeland trend*, and *rangeland health*.

Similarity index is a comparison of the present plant community to the historic climax plant community. Similarity index is the percentage, by weight, of historic climax vegetation that is found in present plant community. Similarity index provides an indication of past disturbance as well as potential for improvement.

Rangeland trend determinations assess the direction of change occurring in the present plant community compared to the historic climax plant community. The plant community may be either moving toward or away from the historic climax plant community. This rating provides information to the landowner regarding the direction of change in plant community in response to present management.

Rangeland health is a determination of how the ecological processes on a rangeland ecological site are functioning. Ecological processes that are evaluated include the water cycle, the nutrient cycle, and the energy flow.

How rangeland is managed affects forage production, species composition, plant health, and the ability of the vegetation to protect the soil. Rangeland management requires knowledge of the kinds of soil and of the historic climax plant community. Effective range management conserves rainfall, enhances water quality, reduces the hazard of downstream flooding, improves yields, provides forage for livestock and wildlife, enhances recreational opportunities, and protects the soil.

The primary range management practices used in Fayette County include prescribed grazing, stock-water developments, and fences. If undesirable plants become dominant, range seeding, brush management, or prescribed burning are commonly used.

Table 7 shows, for each soil that supports rangeland vegetation suitable for grazing, the ecological site name, and the potential annual production of vegetation in favorable, normal, and unfavorable years. An explanation of the column headings in this table follows.

Potential annual production is the amount of vegetation that can be expected to grow annually on well-managed rangeland. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruit of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperature make growing conditions substantially better than average. In a normal year, growing conditions are near the historical monthly average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as stage of maturity, exposure, amount of shade, recent rains, and unseasonable dry periods.

Knowledge of the ecological site is necessary as a basis for planning and applying the management needed to maintain or improve the desired plant community for selected uses. Such information is needed to support management objectives, develop planned grazing systems and stocking rates, determine suitable wildlife management practices, evaluate the potential for recreational uses, and determine the condition of watersheds.

Seven ecological sites, including the Blackland, Chalky Ridge, Clay Loam, Clayey Bottomland, Claypan Prairie, Eroded Blackland, and Loamy Bottomland are in the Southern Blackland Prairie MLRA.

Ten ecological sites, including the Claypan Prairie, Claypan Savannah, Deep Sand, Gravelly, Loamy Bottomland, Loamy Sand, Sandy, Sandy Bottomland, Sandy Loam, and Sandstone Hills, are in the Southern Claypan MLRA.

Following is a description of the ecological sites in Fayette County.

Blackland Ecological Site

The Bleiblerville, Branyon, Burleson, Frelsburg, Greenvine, Latium, Luling, Elmendorf, and Denhawken soils are in this site, which occurs only in the Southern Blackland Prairie MLRA. The climax vegetation is a tall grass prairie where a few large live oak, elm, and hackberry trees are along drainageways and in motts. The composition is 85 percent grasses, 5 percent woody plants, and 10 percent forbs. This site has high natural fertility. Little bluestem, indiangrass, and big bluestem produce most of the forage in climax. Other grasses, such as switchgrass, sideoats grama, Texas wintergrass, Texas cupgrass, tall dropseed, Florida paspalum, and Virginia wildrye, make up the rest. Woody plants are live oak, elm, hackberry, bumelia, and coralberry. Many palatable forbs and legumes are native to the site.

Overgrazing by cattle eventually kills tall grasses, such as big bluestem, indiangrass, switchgrass, and eastern gamagrass. They are replaced by silver bluestem, Texas wintergrass, tall dropseed, and other mid grasses. With continued grazing pressure, buffalograss, Texas grama, tumblegrass, annual weeds, and annual grasses dominate, and noxious

brush species, such as mesquite, winged elm, Retama, baccharis, and huisache invade the site.

Clay Loam Ecological Site

The Brenham, Carbengle (fig 19), Flatonia, Krum, Schulenburg, and Rabbs soils are in this site, which occurs only in the Southern Blackland Prairie MLRA. In pristine condition, this true tall grass prairie site is highly productive. The composition is 85 percent grasses, 5 percent woody plants, and 10 percent forbs. Little bluestem dominates the site, making up more than half of the total annual yield. Indiangrass, big bluestem, switchgrass, Virginia and Canada wildrye, and Florida paspalum make up lesser amounts, followed by sideoats grama, silver bluestem, low panicums, Texas wintergrass and short grasses. Woody plants include hackberry, elm, pecan, and oak trees. The primary forbs are Maximilian sunflower, Engelmann daisy, penstemon, bundleflower, and many other legumes.

As retrogression occurs because of overgrazing, tall grasses, such as bluestems, indiangrass, switchgrass, and Florida paspalum decrease, and are replaced by sideoats grama, silver bluestem, low panicums, Texas wintergrass, and tall dropseed. In a deteriorated condition, invader plants, such as threeawns, hairy grama, red lovegrass, Texas grama, buffalograss, tumblegrass, western ragweed, broomweed, prairie coneflower, and woody plants, such as mesquite, baccharis, yaupon, and hawthorn, dominate the site, reducing the total production potential.

Chalky Ridge Ecological Site

The Renish soil is in this site, which occurs only in the Southern Blackland MLRA. This site is a true prairie site. Large live oak trees occurring either singly or in small motts, offer some shade. The scattered trees, rolling topography, and many native flowering forbs make this an attractive site.

The herbaceous plant community is dominated by little bluestem, which generally produces as much as two-thirds of the total annual yield. Indiangrass, big bluestem, Florida paspalum, and Canada and Virginia wildrye are also very important and are often the dominant grasses. Sideoats grama, silver bluestem, and tall dropseed are mid grasses usually present in smaller amounts. Many forbs and legumes will also provide valuable grazing and an attractive landscape.

As retrogression occurs, the tall grasses decrease and are replaced by sideoats grama, Texas wintergrass, silver bluestem, buffalograss, threeawns, and less palatable forbs. With continued abuse, short grasses, such as red grama, hairy grama, Texas grama, tumblegrass, and threeawns invade along with weeds, such as ragweed, broomweed, and curlycup gumweed. Woody invaders include pricklypear, baccharis, and mesquite.

Clayey Bottomland Ecological Site

The Ganado, Roetex, Ships, and Trinity soils are in this site, which occurs only in the Southern Blackland Prairie MLRA. The climax plant community is a tall grass savannah. Oak, elm, hackberry, cottonwood, ash, black willow, some pecan, and other large trees make up about one-fourth of the canopy cover. The canopy is generally heavier along streams or drainageways. Cool-season grasses and sedges grow under the canopy, and warm-season grasses and forbs dominate the open areas. The composition is 75 percent grasses, 20 percent woody plants, and 5 percent forbs.

Beaked panicum, switchgrass, indiangrass, vine mesquite, Florida paspalum and others comprise more than half the total grass composition, followed by sedges, Virginia wildrye, Canada wildrye, and rustyseed paspalum. Buffalograss, long leaf uniola, knotroot bristlegrass, and other grasses comprise the rest. The forbs are tickclover, snoutbean, lespedeza, and gayfeather.

Livestock prefer this ecological site. Heavy grazing and fire suppression reduce the warm-season grasses and forbs and allow the brush to form a dense canopy. Shade-tolerant plants then dominate the understory and total usable forage is drastically reduced.

Claypan Prairie Ecological Site

The Cadell, Crockett, Hallettsville, Normangee, Wilson, Zack, and Zulch soils are in this site, which occurs in both the Southern Blackland Prairie and Southern Claypan MLRAs. In climax condition, this is a true tall grass prairie site. Oak, elm, and hackberry trees are along drainageways or in motts. The composition of the climax plant community is 85 percent grasses, 5 percent woody plants, and 10 percent forbs.

Little bluestem and indiangrass make up about two-thirds of the total plant composition of the climax plant community. Switchgrass, big bluestem, Virginia wildrye, Canada wildrye, Florida paspalum, sideoats grama, meadow dropseed, Texas wintergrass, and vine mesquite make up a lesser amount, followed by purpletop, brownseed paspalum, longspike tridens, buffalograss, low panicums, fall switchgrass, and sedges. Woody plants include live oak, elm, hackberry, bumelia, coralberry, and an occasional post oak. Forbs include Maximilian sunflower, Engelmann daisy, halfshrub sundrop, western indigo, and prairie-clover.

With continued overgrazing, big bluestem, little bluestem, indiangrass, and switchgrass decrease and

Figure 19.—Livestock production is a major land use in Fayette County. These horses are grazing in an area of Carbengle sandy clay loam, 3 to 5 percent slopes, which is in the Clay Loam ecological site.

meadow dropseed, silver bluestem, sideoats grama, and Texas wintergrass increase. Finally, mesquite and pricklypear invade and buffalograss, Texas wintergrass, Texas grama, windmillgrass, and weedy forbs dominate the site.

Claypan Savannah Ecological Site

The Arol, Burlewash, Edge, Gredge, Kurten, Lufkin, Shalba, Singleton, and Winedale soils are in this site, which occurs only in the Southern Claypan MLRA. The climax plant community is a savannah where post oak and blackjack oak provide 15 to 20 percent canopy cover. The composition is about 80 percent grasses, 15 percent woody plants, and 5 percent forbs.

Under climax conditions, about two-thirds of the total plant composition is little bluestem, indiangrass, and brownseed paspalum. Other grasses are switchgrass, Florida paspalum, purpletop, low panicums, low paspalums, silver bluestem, tall dropseed, and Texas wintergrass. Woody plants include post oak, blackjack oak, elm, yaupon, hawthorn, and American beautyberry. Forbs include dayflower, bundleflower, sensitive briar, tickclover, wildbean, and lespedeza.

As retrogression occurs because of heavy grazing, fire suppression, or both, little bluestem, indiangrass, and switchgrass are replaced by brownseed paspalum, silver bluestem, arrowfeather threeawn, tall dropseed, purpletop, and low panicums. Woody plants, such as post oak, elm, yaupon, and hackberry, increase and form a dense canopy that suppresses grass and forb production.

Deep Sand Ecological Site

The Joiner and Padina soils make up this site, which occurs only in the Southern Claypan MLRA. The climax vegetation is a savannah where post oak and blackjack oak provide 20 to 25 percent canopy cover. The understory consists of mid to tall grasses. The composition is 80 percent grasses, 15 percent woody plants, and 5 percent forbs.

Little bluestem makes up about half of the total plant composition. Indiangrass is also present, followed in lesser amounts by purpletop, switchgrass, and sand lovegrass. Other grasses are low panicums, purple lovegrass, sand dropseed, brownseed paspalum, and splitbeard bluestem. Woody plants include blackjack

oak, post oak, and shrubs such as yaupon, hawthorn, and American beautyberry, which are the understory species. Forbs include legumes such as lespedeza, tickclover, and partridge pea.

As retrogression occurs, little bluestem, sand lovegrass, indiangrass, and purpletop decrease and low panicums, low paspalums, purple lovegrass, and woolysheath threeawn increase. Oak and yaupon increase to form a dense canopy. The decreasing and increasing plants finally are replaced by red lovegrass, tumble lovegrass, crabgrass, red sprangletop, sandbur, brackenfern, pricklypear, and queen's delight, reducing production of forage a minimum.

Eroded Blackland Ecological Site

The Latium and Greenvine soils are in this site, which occurs only in the Southern Blackland Prairie MLRA. The potential plant community is a tall grass prairie. Although cultivation has destroyed the climax vegetation, and erosion has reduced the productive ability of the site, the altered site grows essentially the same tall grasses as the Blackland ecological site. Forty years or more are required for secondary plant succession to reestablish under natural conditions. The potential plant community is 85 percent grasses, 5 percent woody plants, and 10 percent forbs.

Little bluestem, indiangrass, and big bluestem make up amost three-fourths of the potential plant community. Virginia wildrye, Canada wildrye, switchgrass, Florida paspalum, sideoats grama, tall dropseed, silver bluestem, Texas wintergrass, and vine mesquite make up a lesser amount. Woody plants include live oak, hackberry, elm, bumelia, and coralberry. Forbs include Maximilian sunflower, Engelmann daisy, and bundleflower.

Most of this site is in some intermediate stage of secondary plant succession. Silver bluestem, tall dropseed, Texas wintergrass, sideoats grama, and buffalograss normally dominate and they respond as increasers. With continued heavy use, buffalograss, Texas wintergrass, or both, will dominate the site.

Gravelly Ecological Site

The Burlewash, Carmine, and Rek soils are in this site, which occurs only in the Claypan MLRA. In pristine condition, this site is a post oak, blackjack oak savannah. The overstory of oak and associated species shade about 15 to 20 percent of the ground. The understory is dominated by little bluestem, which constitutes as much as two-thirds of the total plant composition. Indiangrass, beaked panicum, purpletop, brownseed paspalum, and sideoats grama occur in smaller amounts. Palatable, cool-season forage plants are scarce. A variety of forbs, legumes, shrubs, and woody vines grow on this site.

As retrogression occurs, the tall decreasers are replaced by increasers, such as brownseed paspalum, low panicums, and dropseeds. As further abuse occurs, oak, yaupon, greenbriar, hawthorns, and American beautyberry often form a dense overstory, severely limiting herbaceous plant production. In a deteriorated condition, annual grasses and forbs, such as eastern red cedar, baccharis, bitter sneezeweed, mesquite, and broomsedge bluestem dominate the site and limit productivity.

Loamy Bottomland Ecological Site

The Bergstrom, Bosque, Coarsewood, Degola, Navidad, Pursley, Smithville, Uhland, Warda, and Weswood soils are in this site, which occurs in both the Southern Claypan and Southern Blackland MLRAs. The climax plant community is a tall grass savannah where trees shade 30 percent of the ground. The overstory consists of oak, pecan, hackberry, elm, cottonwood, and hickory or ash trees. The understory consists of hawthorns, greenbriar, honeysuckle, grapes, and peppervines. Cool-season grasses and sedges dominate the shaded areas, and warm-season grasses dominate the other areas. The composition is 75 percent grasses, 20 percent woody plants, and 5 percent forbs.

Virginia wildrye, sedges, and rustyseed paspalum grow in the shaded and wet areas and make up one-fourth of the total plant composition. Switchgrass, beaked panicum, indiangrass, big bluestem, little bluestem, eastern gamagrass, vine mesquite, and purpletop grow in the open areas and make up one-third. Redtop panicum, gaping panicum, low panicums, uniolas, buffalograss, knotroot bristlegrass, Texas wintergrass, and other grasses are present in smaller amounts. The forbs are tickclover, lespedeza, snoutbean, partridge pea, and gayfeather.

Livestock prefer this site. The warm-season grasses and forbs are reduced by overgrazing and fire suppression, which increase the tree and brush canopy. Shade-tolerant grasses and forbs then dominate and forage production is drastically reduced.

Loamy Sand Ecological Site

The Chazos, Dubina, Dutek, Knolle, Rutersville, Shiro, and Straber soils are in this site, which occurs only in the Southern Claypan MLRA. The climax plant community is a savannah where post oak and blackjack oak provide 10 to 15 percent canopy cover. Tall grasses grow between the oak trees. The composition is 85 percent grasses, 10 percent woody plants, and 5 percent forbs.

The predominant grass on this site is little bluestem, which makes up about 40 percent of the total plant

composition, followed by switchgrass, indiangrass, and beaked panicum. Other grasses adapted to this site are sand lovegrass, longleaf uniola, brownseed paspalum, purpletop, and other low panicums and paspalums.

With overgrazing, this site will lose decreaser plants, such as bluestems, indiangrass, and switchgrass. These plants are replaced by increasers, such as brownseed paspalum, oaks, brush, annual grasses, and forbs.

Sandstone Hills Ecological Site

The Koether soil is in this site, which occurs only in the Southern Claypan MLRA. The climax plant community is a savannah of oak, live oak, blackjack oak, and hickory trees and an open stand of mid to tall grasses. Open areas are dominated by grasses, such as little bluestem, sideoats grama, tanglehead, and silver bluestem. Forbs, legumes, woody vines, and shrubs add variety to the climax plant community.

As retrogression occurs, the surface soil compacts and sheet erosion can occur as the amount of bare ground increases. The tall grasses decrease and are replaced by less palatable and robust plants, such as annual threeawn, red lovegrass, and gummy lovegrass. Understory brush, such as American beautyberry and yaupon can invade the more wooded areas. The landscape can be beautifully decorated with flowering plants, such as bluebonnets, Indian paintbrush, Liatris, and primroses. Unique to the site is the abundance of odd, egg-shaped rocks on the soil surface.

Sandy Ecological Site

The Rehburg, Robco, and Tremona soils are in this site, which occurs only in the Southern Claypan MLRA. The climax vegetation is an open savannah of post oak and blackjack oak. The interspaces are predominantly tall grasses. The composition is 80 percent grasses, 15 percent woody plants, and 5 percent forbs.

Little bluestem makes up about half of the total plant composition, followed by indiangrass in lesser amounts. Switchgrass, beaked panicum, sand lovegrass, purpletop, and brownseed paspalum are present along with other grasses, such as fringeleaf paspalum, purple lovegrass, tall dropseed, splitbeard bluestem, and low panicums. Post oak and blackjack oak shade about 20 to 25 percent of the ground. Woody plants in the understory are hawthorn, American beautyberry, greenbriar, yaupon, and berry vines. The forbs are lespedeza, tickclover, sensitive briar, snoutbean, tephrosia, partridge pea, and western ragweed.

With continuous overgrazing and the lack of natural fires, the taller grasses are grazed out, shaded out, or both, by an increasing canopy of woody plants. The little bluestem, indiangrass, and switchgrass are replaced by brownseed paspalum, tall dropseed, fall witchgrass, and other increasing species. They, in turn, are grazed out and replaced by red lovegrass, yankeeweed, bullnettle, snakecotton, and croton. Other invading plants are broomsedge bluestem, smutgrass, sandbur, pricklypear, queen’s delight, beebalm, pricklypoppy, baccharis, and waxmyrtle. Woody plants increase and invade to form dense thickets.

Sandy Bottomland Ecological Site

The Gad soil and Ustorthents are in this site, which occurs only in the Southern Claypan MLRA. The climax vegetation is a tall grass savannah. Live oak, cottonwood, and other large trees dominate the overstory. Little bluestem, indiangrass, and switchgrass make up more than half of the herbaceous plant community. The composition is about 75 percent grasses, 20 percent woody plants, and 5 percent forbs.

As regression occurs because of heavy grazing, the better grasses are replaced by less palatable plants, such as Pan-American balsamscale, knotroot bristlegrass, and red lovegrass. If continued abuse continues for many years, mesquite, grassbur, bullnettle, willows, and short grasses, such as hairy grama will increase significantly.

Sandy Loam Ecological Site

The Gholson and Inez soils are in this site. The climax plant community is a savannah where post oak and blackjack oak provide 20 to 25 percent canopy cover. The understory consists of mid and tall grasses, the most dominant being little bluestem, which makes up half of the total plant composition. The total composition is 80 percent grasses, 15 percent woody plants, and 5 percent forbs.

Little bluestem is the dominant grass, followed by indiangrass, which makes up about 10 percent of the total plant composition. Eastern gamagrass, switchgrass, big bluestem, beaked panicum, and longleaf uniola are present in lesser amounts along with numerous other grasses. The most dominant woody plants are post oak and blackjack oak. Numerous other woody plants include elm, yaupon, greenbriar, American beautyberry, and berry vines. The forbs include Engelmann daisy, gayfeather, sensitive briar, and native legumes.

The site deteriorates if wildfires are reduced and overgrazing continues. Woody canopy increases and tall grasses, such as little bluestem, indiangrass, big bluestem, and eastern gamagrass decrease. These plants are replaced by plants, such as brownseed paspalum. If overgrazing persists, the site deteriorates to oak and brush thickets, annual grasses, forbs, and carpetgrass.

Woodland Management and Productivity

Samuel E. Brown, Jr., soil scientist, Dennis Neuman, District conservationist, Natural Resources Conservation Service and Hugo Koenning, Texas Forest Service, helped prepare this section.

Woodland is not a major land use in Fayette county; however, several soils can potentially produce a limited amount of commercial timber. In the past, trees such as cypress, mixed hardwoods, and pine were cut for private and commercial use. Local saw mill operations no longer exist in the county. However, a few unmanaged stands of loblolly pine are cut in the Lost Pines Forest and shipped to East Texas saw mills.

The Lost Pines Forest, in the northwest part of the county, has soils that support good stands of loblolly pine *(4)*. Natural reforestation from unmanaged stands cut in the 1920's and 1930's represent the forest today. Consisting mainly of loblolly pine, recent clear cut areas continue to maintain natural reforestation.

The Lost Pines Forest comprises about 15,261 acres of potential commercial trees. Most of the forest is privately owned and a few ownerships are certified as tree farms. The average age of trees in the Lost Pine Forest ranges from 60 to 70 years. Most of the forest is characterized by nearly level to gentle slopes. Tree heights range from 65 to 70 feet. In steep sloping areas, tree height ranges up to 100 feet.

If timber management practices are used, the Burlewash, Edge, Gredge, and Winedale soils in the Lost Pines Forest are potentially suitable for growing and maintaining commercial pine forest. Presently, timber management practices, such as fire prevention and insect infestation control, are implemented by the Texas Forest Service.

Soils on the bottom lands of the Colorado River and associated tributaries are suited to hardwood growth and management. These soils include the Bergstrom, Coarsewood Degola, Ganado, and Pursley map units. The hardwood is being cut and sold as firewood in metropolitan areas. Cedar is recognized as a commercial woodland product, but is not managed as such.

Recreation

James A. Douglass II, soil scientist, Natural Resources Conservation Service, helped prepare this section.

In most of the county, the potential for recreational development is medium to high because of the suitable soils, climate, water, and vegetation, especially coniferous and hardwood trees.

Fayette County Reservoir, numerous flood prevention lakes, and several other smaller lakes provide fishing and other water-related recreational activities. Primitive overnight camping and picnic areas are available at Fayette County Reservoir. Monument Hill State Park offers a number of recreational activities. Many areas along the Colorado River and its tributaries are suited to recreational uses. Many private water areas, ranging from 10 to 50 acres are in the county. Limited accessibility reduces the potential for development of some scenic areas.

White-tailed deer, turkeys, squirrel, bobwhite quail, and waterfowl inhabit the survey area, and provide hunting opportunities for local residents and visitors. Several residential developments also provide recreational facilities. Numerous state historical markers and sites are throughout the county.

The soils of the survey area are rated in table 8 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 8, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or a combination of these measures.

The information in table 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry.

Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Dennis Neuman, Samuel Brown, and Gary Valentine, Natural Resources Conservation Service, and David Terre and Bob Carroll, Texas Parks and Wildlife Department, helped prepare this section.

Fayette County is divided in half by the Colorado River, which enters the county from the northwest and flows southeast into Colorado County. Major tributaries of the Colorado River are Navidad, Buckners, Cummins, and Rabbs Creeks. Fayette County Reservoir, a 2,400-acre impoundment southeast of La Grange, impounds part of Cedar Creek. Twenty floodwater retarding structures are on tributaries of Cummins Creek. Scattered throughout the county are 2,500 farm ponds, averaging 0.5 surface acre in size.

Open and vegetated marshes on the flood plain of the Colorado River are the only natural wetlands in the county. About 1,000 acres of wetlands are in river oxbows and channel scars on Roetex soils. Duration and frequency of flooding within the bottom land habitat are insufficient to create additional natural wetlands. Constructed impoundments throughout the county have associated wetland values.

The fish population in Fayette County Reservoir, a cooling reservoir for Fayette Power Plant, is stocked and managed by the Texas Parks and Wildlife Department. Generally, management is for largemouth bass, mainly the Florida strain, although fishing is seasonally good for white crappie, black crappie, channel catfish, flathead catfish, bluegill, and redear sunfish.

Since the late 1970's, most farm ponds and larger private impoundments have been stocked with help from the Fayette Soil and Water Conservation District, which recommends channel catfish for ponds less than a surface acre in size. Fathead minnows or a commercial fish ration are recommended as a food source. Largemouth bass and channel catfish are recommended for ponds larger than a surface acre in size. Bluegill and redear sunfish, threadfin, shad, and golden shiner are recommended as a food source for bass.

White-tailed deer, the most popular wildlife in the county, are scattered throughout; however, the highest populations are on bottom land soils along the Colorado River, Rabbs Creek, Cummins Creek, Buckners Creek between Muldoon and the Colorado River, and Cedar Creek around the Fayette County Reservoir.

Fayette County does not offer good habitat for bobwhite quail and mourning dove. Prairie upland soils provide the best opportunity for managing these game birds. The combination of cropland and rangeland satisfies structural habitat needs. Corn and grain sorghum are grown in these areas and are readily eaten by quail and doves. Soils on prairie uplands can produce an abundance of food for native birds with little management effort.

Low numbers of the Rio Grande wild turkey are throughout the county. The Texas Parks and Wildlife Department traps and transports birds to suitable habitat. Flocks inhabit bottom land soils along the Colorado River, Buckners Creek, Rabbs Creek, Navidad Creek, and Cedar Creek around the Fayette County Reservoir.

Migratory waterfowl flourish in natural wetlands, streams, and reservoirs. Geese and sandhill cranes feed on small grain crops on the prairie upland soils and bottom land soils, and fly to reservoirs for resting and roosting. Coots, cormorants, ruddy duck, ring-necked duck, and scaups are observed in open areas of larger reservoirs. Ring-necked ducks, gadwall, and widgeon use smaller reservoirs and farm ponds during fall and winter. Mallard, pintail, teal, and wood ducks feed and rest in shallows of reservoirs and natural wetlands.

Alligators are occasionally reported on natural wetlands and in gravel pits associated with the Colorado River. The federally endangered southern bald eagle nests along the Colorado River. Migratory eagles are seen on Fayette County Reservoir during the winter.

The Fayette Soil and Water Conservation District and the Natural Resources Conservation Service have assisted landowners for many years in preparing conservation plans that include conservation practices that benefit fish and wildlife. Many farmers plan conservation tillage on their cropland. This practice of leaving waste grain and crop stubble on the soil surface after harvest benefits bobwhite quail, mourning dove, ducks, and sandhill cranes. Removal of brush and trees from pastures is frequently planned, while retaining motts or strips of clover for white-tailed deer, wild turkey, and bobwhite quail. Cleared areas frequently are planted to a variety of grasses, legumes, and forbs, which benefit many kinds of wildlife. Grazing systems are planned that defer pastures from livestock grazing during the fawning and nesting seasons, April through June. Proper grazing and prescribed burning encourage production of desirable forbs and browse plants for deer, turkeys, and quail.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 9, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are grain sorghum, chufa, millet, and corn.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are annual ryegrass, switchgrass, kleingrass, vetch and clover.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are paspalums, vine-mesquite, low panicums, croton, annual sunflower, and partridge pea.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are live oak, pecan, hackberry, prickly ash, and mockernut hickory.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, cedar, and juniper.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are yaupon, American beautyberry, and dewberry.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, sedges, bulrushes, and cattail.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, white-tailed deer, wild turkey, mourning dove, cottontail, and coyote.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, woodpeckers, squirrels, foxes, bobcats, and owls.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, sandhill cranes, kingfishers, beavers, and alligators.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include white-tailed deer, cottontails, roadrunners, harriers, skunks, larks, meadowlarks, and coyotes.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the "Glossary."

Building Site Development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 11 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides

is required to minimize seepage and contamination of ground water.

Table 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated*poor* have a plasticity index of

more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. The underlying material is not rated and should be evaluated during an onsite investigation. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, and sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind erosion or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts and sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 20.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading “Soil Series and Their Morphology.”

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. “Loam,” for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, “gravelly.” Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified Soil Classification System *(2)* and the system adopted by the American Association of State Highway and Transportation Officials *(1)*.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 14.

Rock fragments 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly

by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $^{1}/_{3}$-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the

load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; *high*, more than 6 percent; and *very high*, greater than 9 percent.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.64. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are as follows:

1. Coarse sands, sands, fine sands, and very fine sands.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, ash material, and sapric soil material.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material.

8. Soils that are not subject to wind erosion because of coarse fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 15, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep and very deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep to very deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Table 16 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of flooding is more than 50 percent in any year). Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on observations of the water table at selected sites and on the evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table—that is, perched, aparent, or artesian; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 16.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separted from a lower one by a dry zone. An *artesian* water table is under hydrostatic head, generally below an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. “More than 6.0” indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low, moderate,* or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Physical and Chemical Analyses of Selected Soils

The results of physical and chemical analysis of several typical pedons in the survey area are given in tables 17 and 18. The clay mineralogy of selected soils is given in table 19. The data are for soils sampled at carefully selected sites. Unless otherwise indicated, the pedons are typical of the series. They are

described in the section “Soil Series and Their Morphology.” Soil samples were analyzed by the Soil Characterization Laboratory, Texas Agricultural Experiment Station, College Station, Texas; and by the Department of Plant and Soil Science, Texas Tech University, Lubbock, Texas.

Most determinations, except those for grain-size analysis and bulk density, were made on soil material smaller than 2 millimeters in diameter. Measurements reported as percent or quantity of unit weight were calculated on an ovendry basis. The methods used in obtaining the data are indicated in the list that follows. The codes in parentheses refer to published methods *(9)*.

Sand—(0.05-2.0 mm fraction) weight percentages of material less than 2 mm (3A1).
Silt—(0.002-0.05 mm fraction) pipette extraction, weight percentages of all material less than 2 mm (3A1).
Clay—(fraction less than 0.002 mm) pipette extraction, weight percentages of material less than 2 mm (3A1).
Water retained—pressure extraction, percentage of ovendry weight of less than 2 mm material; $^1/_3$ or $^1/_{10}$ bar (4B1), 15 bars (4B2).
Moist Bulk density—of less than 2 mm material, saran-coated clods (4A1).
Organic carbon—dichromate, ferric sulfate titration (6A1a).
Extractable cations—ammonium acetate pH 7.0, uncorrected; calcium (6N2), magnesium (6O2), sodium (6P2), potassium (6Q2).
Reaction (pH)—1:1 water dilution (8C/a).
Cation-exchange capacity—ammonium acetate, pH 7.0 (5A1a).
Base saturation—sum of cations, TEA, pH 8.2 (5C3).
Extractable acidity *(6H).*
Aluminum—potassium chloride extraction (6G).
Electrical conductivity—saturation extract (8A1a).
SAR, sodium adsorption ratio (5E).
Exchangeable sodium percentage (5D2).
Clay mineralogy—(*7A2i*).

Engineering Index Test Data

Table 20 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are representative of the series described in the section “Soil Series and Their Morphology.” The soil samples were tested by the Soil Mechanics Laboratory, Natural Resources Conservation Service, Fort Worth, Texas.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO).

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(6)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 21 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Ustalf (*Ust*, meaning burnt, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Paleustalfs (*Pale*, meaning extensive horizonation, plus *ustalf*, the suborder of the Alfisols that has an ustic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Ultic* identifies one subgroup of the great group. An example is Ultic Paleustalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle size, mineral content, soil temperature regime, soil depth, and reaction. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine, smectitic, thermic Ultic Paleustalfs.

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. There can be some variations in the texture of the surface layer or of the substratum within a series. An example is the Burlewash series, which is a member of the fine, smectitic, thermic Ultic Paleustalfs.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the “Soil Survey Manual” *(8)*. Many of the technical terms used in the descriptions are defined in “Soil Taxonomy” *(6)* and in “Keys to Soil Taxonomy” *(7)*. Unless otherwise indicated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section “Detailed Soil Map Units.”

Arol Series

The Arol series consists of moderately deep, moderately well drained, loamy soils on uplands (fig. 20). These soils formed from tuffaceous materials. Slopes range from 0 to 2 percent.

Typical pedon of Arol fine sandy loam, 0 to 2 percent slopes; in La Grange, from the intersection of U.S. Highway 77 and Texas Highway 71, 2.7 miles north on U.S. Highway 77, 9.9 miles northeast on Farm Road 2145, 2.3 miles west on county road, 1.2 miles southwest on county road, 1.7 miles south on county road, and 320 feet east in pasture.

Ap—0 to 5 inches; light brownish gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) moist; weak coarse subangular blocky structure parting to weak fine subangular blocky; hard, very friable; few fine roots; few fine pores; moderately acid; abrupt smooth boundary.

Bt1—5 to 15 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; common fine and medium faint grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; extremely hard, very firm; many very fine roots; common fine clay films on faces of peds; moderately acid; clear smooth boundary.

Bt2—15 to 23 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; common fine and medium faint grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; extremely hard, very firm; common very fine roots; common fine clay films on faces of peds; common pockets of E material; slightly acid; clear smooth boundary.

Bt3—23 to 37 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; extremely hard, very firm; few very fine roots; few fine clay films on faces of peds; neutral; clear wavy boundary.

Cr—37 to 54 inches; light brownish gray (2.5Y 6/2) and light gray (2.5Y 7/2) tuff; common fine and medium distinct yellowish brown (10YR 5/8) and common fine and medium distinct very dark grayish brown (10YR 3/2) mottles; massive; hard; few fine roots along fractures; neutral.

The thickness of the solum ranges from 20 to 40 inches. The COLE can exceed 0.09 in the Bt horizons, but the potential linear extensibility of the total soil is less than 6 centimeters.

The A horizon is dark grayish brown, grayish brown, light brownish gray, or gray. It has hue of 10YR, value of 4 to 6, and chroma of 1 or 2. The soil is hard and massive when dry. Reaction is strongly acid to slightly acid. The boundary between the A and Bt horizons is wavy in undisturbed areas and smooth in cultivated areas.

The Bt1 horizon is black, very dark gray, very dark grayish brown, or dark gray. It has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Mottles in shades of gray are common throughout. The content of clay is 35 to 50 percent. Reaction ranges from strongly acid to neutral.

The Bt2 and Bt3 horizons are very dark gray, dark gray, grayish brown, or light brownish gray. They have hue of 10YR, value of 3 to 6, and chroma of 1 or 2. Mottles in shades of gray are few and common throughout. The texture is clay or clay loam. The content of clay is 35 to 50 percent. Reaction ranges from moderately acid to slightly alkaline.

Some pedons have a BC or BCk horizon. It is gray, grayish brown, or light brownish gray. It has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 1 to 3. The texture is clay or clay loam that contains masses of weathered tuffaceous material. Concretions of calcium carbonate are in many pedons. Reaction is neutral or slightly alkaline.

The Cr horizon is pale olive, pale yellow, light brownish gray, or light gray. It has hue of 10YR, 2.5Y, or 5Y, value of 5 to 8, and chroma of 1 to 3. It is weakly cemented tuff that has texture of silt loam, silty clay loam, or clay. Reaction is neutral or slightly alkaline.

Bergstrom Series

The Bergstrom series consists of very deep, well drained, loamy soils on terraces of the Colorado River. These soils formed in calcareous alluvium. Slopes are 0 to 1 percent.

Typical pedon of Bergstrom silt loam, rarely flooded; in La Grange, from the intersection of U.S. Highway 77 and Texas Highway 71, 1.5 miles west on Texas Highway 71, 1.5 miles northwest on county road, 0.8 mile northeast, 0.2 mile northwest, 1.1 miles northeast on field road, and 100 feet northwest in pasture.

Ap—0 to 4 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, friable; common fine and very fine roots; common fine pores; few wormcasts; strongly effervescent; moderately alkaline; abrupt smooth boundary.

A1—4 to 18 inches; very dark grayish brown (10YR 3/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, friable; few fine and very fine roots; few fine pores; common fine distinct dark patches on faces of peds; few wormcasts; strongly effervescent; moderately alkaline; gradual smooth boundary.

A2—18 to 24 inches; dark brown (7.5YR 3/2) silt loam, dark brown (7.5YR 3/2) moist; weak medium subangular blocky structure; hard, friable; common

fine and very fine roots; few fine pores; few wormcasts; violently effervescent; moderately alkaline; gradual smooth boundary.

A3—24 to 28 inches; brown (7.5YR 4/2) silt loam, dark brown (7.5YR 3/2) moist; weak medium subangular blocky structure; hard, very friable; few fine and very fine roots; few very fine pores; few wormcasts; violently effervescent; moderately alkaline; gradual smooth boundary.

Bw1—28 to 38 inches; brown (7.5YR 4/4) silt loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; hard, very friable; few very fine roots; few very fine pores; few fine threads of calcium carbonate on faces of peds; violently effervescent; moderately alkaline; gradual smooth boundary.

Bw2—38 to 56 inches; brown (7.5YR 5/4) silt loam, brown (7.5YR 5/4) moist; weak medium subangular blocky structure; hard, friable; few very fine roots; common threads of calcium carbonate on faces of peds; violently effervescent; moderately alkaline; gradual smooth boundary.

C—56 to 80 inches; strong brown (7.5YR 5/6) silt loam, strong brown (7.5YR 5/6) moist; massive; soft, very friable; common fine threads of calcium carbonate on faces of peds; violently effervescent; moderately alkaline.

The 10-to 40-inch control section has 22 to 35 percent clay and less than 15 percent sand more coarse than very fine sand.

The A horizon is dark grayish brown, dark brown, or brown. It has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 or 3.

The B horizon is reddish brown, brown, strong brown, or yellowish red. It has hue of 5YR or 7.5YR, value of 3 to 5, and chroma of 2 to 4. The texture is silt loam or silty clay loam.

The C horizon is in shades of brown, yellow, or red. It has hue of 2.5YR to 10YR, value of 3 to 5, and chroma of 4 to 6. The texture is silt loam or silty clay loam that has strata of clayey or sandy material.

Bleiblerville Series

The Bleiblerville series consists of very deep, moderately well drained, clayey soils on uplands. These soils formed in calcareous clays and marls. Slopes range from 1 to 3 percent.

Typical pedon of Bleiblerville clay, 1 to 3 percent slopes; in La Grange, from the intersection of Texas Highways 71 and 159, 6.6 miles north on Texas Highway 159, 11.1 miles north on Texas Highway 237, 0.2 mile east on private road and 100 feet southwest in pasture.

A—0 to 10 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate medium subangular blocky structure parting to moderate fine subangular blocky; very hard, very firm; common very fine and fine roots; common shiny ped faces; slightly effervescent; neutral; clear smooth boundary.

Bss1—10 to 23 inches; very dark gray (10YR 3/1) clay, very dark gray (10YR 3/1) moist; strong medium subangular blocky structure; very hard, very firm; common very fine and fine roots; common shiny ped faces; common grooved slickensides; common distinct pressure faces; strongly effervescent; slightly alkaline; gradual smooth boundary.

Bss2—23 to 45 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; strong medium angular blocky structure; very hard, very firm; few very fine and fine roots; common shiny ped faces; common distinct pressure faces; many grooved intersecting slickensides; strongly effervescent; slightly alkaline; gradual wavy boundary.

Bkss1—45 to 65 inches; gray (10YR 5/2) clay, dark gray (10YR 4/1) moist; common fine faint very dark gray (10YR 3/1) mottles; strong medium angular blocky structure; very hard, very firm; common distinct pressure faces; common grooved intersecting slickensides; common concretions and soft masses of calcium carbonate; strongly effervescent; slightly alkaline; gradual wavy boundary.

Bkss2—65 to 80 inches; mottled gray (10YR 5/2) and light gray (10YR 7/2) clay; many fine distinct yellow (10YR 7/6 and 10YR 7/8) mottles; strong medium angular blocky structure; very hard, very firm; common distinct pressure faces; few fine soft masses of calcium carbonate; violently effervescent; slightly alkaline.

The thickness of the solum ranges from 60 to more than 100 inches. In native areas, gilgai microrelief consists of microknolls 4 to 16 inches higher than microdepressions. The cycle of microdepressions and microknolls is repeated every 5 to 10 feet. When dry, cracks as much as 3 inches wide extend to a depth of more than 50 inches. Intersecting slickensides begin at a depth of 8 to 15 inches.

The A horizon is black, very dark gray, or dark gray. It has hue of 10YR, value of 2 to 4, and chroma of 1 or less. In most pedons, vertical streaks of darker colored material fill the cracks. Reaction is neutral or slightly alkaline.

The Bss horizons are gray, dark gray, or dark grayish brown. They have hue of 10YR or 2.5Y, value

of 3 to 5, and chroma of 1 or 2. Some pedons have few concretions and soft masses of calcium carbonate.

The Bkss horizons are gray, dark gray, grayish brown, light gray, light brownish gray, or white. They have hue of 10YR or 2.5Y, value of 5 to 8, and chroma of 2 to 4. Concretions and soft masses of calcium carbonate range from common to many.

Some pedons have a C horizon that is olive yellow or gray clay. Marl and shale material that is mainly clay in texture is in some pedons.

Bosque Series

The Bosque series consists of very deep, well drained, loamy soils on flood plains. These soils formed in calcareous loamy sediments. Slopes are 0 to 1 percent.

Typical pedon of Bosque sandy clay loam, occasionally flooded; in Willow Springs, from the intersection of Farm Road 159 and Farm Road 954, 3.3 miles northwest on Farm Road 954, 1.3 miles south on county road, 300 feet east of county road and about 250 feet south of the Cummins Creek channel.

A1—0 to 13 inches; very dark gray (10YR 3/1) sandy clay loam, black (10YR 2/1) moist; moderate fine and medium subangular blocky structure; hard, friable; common fine and medium roots; few fine pores; strongly effervescent; slightly alkaline; gradual smooth boundary.

A2—13 to 28 inches; very dark grayish brown (10YR 3/2) sandy clay loam, very dark gray (10YR 3/1) moist; moderate fine subangular blocky structure; hard, friable; common fine and medium roots; few fine pores; few fine concretions of calcium carbonate; strongly effervescent; slightly alkaline; gradual smooth boundary.

Bw1—28 to 58 inches; grayish brown (10YR 5/2) sandy clay loam, dark grayish brown (10YR 4/2) moist; weak fine and medium subangular blocky structure; hard, friable; common fine and medium roots; strongly effervescent; slightly alkaline; gradual smooth boundary.

Bw2—58 to 80 inches; grayish brown (10YR 5/2) sandy clay loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; slightly hard, friable; common fine roots; few fine threads of calcium carbonate; strongly effervescent; slightly alkaline.

The clay content of the control section ranges from 20 to 35 percent. The soil is calcareous and slightly alkaline throughout.

The A horizon is very dark gray, very dark grayish brown, or dark grayish brown. It has hue of 10YR, value of 3 to 5, and chroma of 1 to 3. Combined thickness of the A1 and A2 horizons is more than 20 inches.

The B horizon is dark grayish brown, grayish brown, or brown. It has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The texture is loam, sandy clay loam, or clay loam.

Branyon Series

The Branyon series consists of very deep, moderately well drained, clayey soils on ancient terraces (fig. 21). These soils formed in calcareous clayey sediments. Slopes are 0 to 1 percent.

Typical pedon of Branyon clay, 0 to 1 percent slopes; in La Grange, from the intersection of U.S. Highway 77 and Texas Highway 71, 1.6 miles south on U.S. Highway 77, 8.1 miles southeast on Farm Road 155, 80 feet west in cropland and 50 feet north of fence.

Ap—0 to 6 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate fine and medium angular blocky structure; extremely hard, very firm; common fine and medium roots; few fine pores; common shiny ped faces; slightly effervescent; neutral; clear smooth boundary.

A—6 to 16 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; dark grayish brown mottles; moderate coarse angular blocky structure parting to moderate fine and medium angular blocky; extremely hard, very firm; common fine and medium roots; common shiny ped faces; few fine concretions of calcium carbonate; strongly effervescent; slightly alkaline; diffuse irregular boundary.

Bss—16 to 59 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; few medium distinct dark grayish brown (2.5Y 4/2) mottles; moderate coarse angular blocky structure parting to moderate medium angular blocky; extremely hard, very firm; few fine roots; common shiny ped faces; many intersecting slickensides; few concretions of calcium carbonate; strongly effervescent; slightly alkaline; diffuse irregular boundary.

Bkss—59 to 75 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 4/2) moist; common medium distinct yellowish brown (10YR 5/4) mottles; moderate coarse angular blocky structure parting to moderate medium angular blocky; extremely hard, very firm; few fine roots; many large intersecting slickensides; common fine and medium concretions of calcium carbonate; strongly effervescent; moderately alkaline.

The thickness of the solum ranges from 45 to more than 80 inches. Most pedons are calcareous. Some are

noncalcareous to a depth of 18 inches in microlows. In native areas, gilgai microrelief consists of microknolls 3 to 12 inches higher than the microdepressions. The distance between the center of the microknoll and the center of the microdepression is 5 to 15 feet. Where dry, cracks 1 to 3 inches wide extend to a depth of more than 20 inches. Intersecting slickensides extend to within 16 inches of the surface in these soils.

The A horizon is dark gray or very dark gray. It has hue of 10YR, value of 3 to 5, and chroma of 1. Reaction ranges from neutral to moderately alkaline.

The Bss horizon is dark gray or very dark gray. It has hue of 10YR, value of 3 to 5, and chroma of 1. Reaction is slightly or moderately alkaline.

The Bkss horizon is dark grayish brown or grayish brown. It has hue of 10YR, value of 4 or 5, and chroma of 2. Few or common mottles in shades of brown, yellow, or olive increase in size and number with depth. Concretions of calcium carbonate range from common to many.

Brenham Series

The Brenham series consists of very deep, well drained, loamy soils on uplands. These soils formed in calcareous silty and clayey sediments. Slopes range from 3 to 8 percent.

Typical pedon of Brenham clay loam, 3 to 8 percent slopes; in La Grange, from the intersection of U.S. Highway 77 and Texas Highway 71, 0.9 mile east on Texas Highway 71, 6.4 miles northeast on Texas Highway 159, 1.0 mile northwest on Farm Road 2981, 0.3 mile northeast on gravel road to farmhouse, 0.3 mile southeast on dirt road, 0.4 mile northeast along fence line and 200 feet northwest in pasture.

A—0 to 10 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure parting to weak fine subangular blocky; hard, firm; many fine and very fine roots; few fine pores; 2 percent pebbles; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk1—10 to 16 inches; light yellowish brown (2.5Y 6/4) silty clay loam, light yellowish brown (10YR 6/4) moist; weak medium subangular blocky structure parting to moderate fine subangular blocky; slightly hard, friable; common fine and very fine roots; few fine and very fine wormcasts; common soft masses of calcium carbonate; violently effervescent; moderately alkaline; clear smooth boundary.

Bk2—16 to 30 inches; pale yellow (2.5Y 7/4) silty clay loam, light gray (2.5Y 7/2) moist; few fine distinct strong brown (7.5YR 5/6) mottles; weak medium angular blocky structure; slightly hard, friable; few fine and very fine roots; common soft masses and concretions of calcium carbonate; violently effervescent; moderately alkaline; clear wavy boundary.

Bk3—30 to 38 inches; pale yellow (2.5Y 7/4) silty clay loam, light gray (2.5Y 7/2) moist; common fine distinct brownish yellow (10YR 6/6) mottles; weak fine angular blocky structure; slightly hard, friable; few fine roots; many soft masses of calcium carbonate; violently effervescent; moderately alkaline.

2Bk1—38 to 56 inches; light yellowish brown (10YR 6/4) silty clay, yellowish brown (10YR 5/4) moist; many medium prominent yellow (10YR 7/8) and (10YR 7/6) mottles; massive; hard, very firm; common fine black concretions; many soft masses of calcium carbonate; strongly effervescent; moderately alkaline.

2Bk2—56 to 80 inches; light yellowish brown (10YR 6/4) silty clay, yellowish brown (10YR 5/4) moist; many medium prominent brownish yellow (10YR 6/8) and many coarse prominent reddish yellow (7.5YR 6/6) mottles; massive; hard, very firm; common fine black concretions; many soft masses of calcium carbonate; strongly effervescent; moderately alkaline.

The thickness of the solum ranges from 40 to 60 inches. The soil is calcareous and moderately alkaline throughout the profile. Calcium carbonate equivalent of the 10-to 40-inch control section ranges from 40 to 60 percent.

The A horizon is very dark grayish brown, dark grayish brown, grayish brown, or very dark gray. It has hue of 10YR, value of 3 to 5, and chroma of 1 or 2.

The Bk1 horizon is yellowish brown, light olive brown, light yellowish brown, or pale yellow. It has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 4 or 5. The texture is silty clay loam or clay loam.

The Bk2 and Bk3 horizons are pale yellow, yellow, or light yellowish brown. They have hue of 10YR or 2.5Y, value of 5 to 8, and chroma of 4 to 6.

The 2Bk horizons are pale yellow, light yellowish brown, or yellow silty clay. Grayish strata can be present. The 2Bk horizons have hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 4 to 6. Mottles in shades of yellow or brown are common. Some pedons do not have 2Bk horizons.

Burleson Series

The Burleson series consists of very deep, moderately well drained, clayey soils on Pleistocene terraces. These soils formed in alkaline clayey sediments. Slopes are 0 to 1 percent.

Typical pedon of Burleson clay, 0 to 1 percent slopes; in La Grange, from the intersection of U.S. Highway 77 and Texas Highway 71, 1.6 miles west on Texas Highway 71, 0.8 mile south on Farm Road 609, 0.3 mile west on county road, 0.2 mile south on county road, 0.8 mile west on county road and 150 feet southwest of fence corner in pasture between a microknoll and microdepression.

Ap—0 to 7 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate medium angular blocky structure; extremely hard, very firm; gray (10YR 6/1) surface crust as much as 0.5 inch thick; common fine roots; few fine siliceous pebbles; slightly alkaline; abrupt smooth boundary.

A—7 to 21 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate medium and coarse angular blocky structure; extremely hard, very firm; few fine roots; common pressure faces; few fine siliceous pebbles; moderately alkaline; gradual wavy boundary.

Bss—21 to 42 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate coarse angular blocky and subangular blocky structure; extremely hard, very firm; few fine roots; few fine black concretions; few fine siliceous pebbles; many grooved intersecting slickensides; moderately alkaline; gradual wavy boundary.

Bkss1—42 to 61 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; common medium faint dark grayish brown (10YR 4/2) mottles and vertical streaks between peds; moderate coarse angular blocky structure; extremely hard, very firm; few fine roots; few fine black concretions and siliceous pebbles; common fine and medium concretions of calcium carbonate; many grooved intersecting slickensides; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bkss2—61 to 75 inches; gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; common medium faint dark grayish brown (10YR 4/2) mottles and vertical streaks of very dark gray (10YR 3/1) soil between peds; moderate coarse angular blocky structure; extremely hard, very firm; few fine roots; few fine black concretions; common fine and medium concretions of calcium carbonate; many grooved intersecting slickensides; strongly effervescent; moderately alkaline; gradual wavy boundary.

2B—75 to 80 inches; light brown (7.5YR 6/4) clay, brown (7.5YR 5/4) moist; common streaks of gray (10YR 5/1) soil between peds; weak medium angular blocky structure; extremely hard, very firm; few fine roots; few fine concretions of calcium carbonate; common fine black concretions; strongly effervescent; moderately alkaline.

The thickness of the solum ranges to more than 60 inches. In native areas, gilgai microrelief consists of microknolls 3 to 10 inches higher than the microdepressions. Distance between the center of the microknolls and the center of the microdepressions is 5 to 15 feet. When dry, cracks 1 to 3 inches wide extend to a depth of more than 25 inches. Intersecting slickensides extend to within 12 inches of the surface in these soils.

The A horizon is gray, dark gray, or very dark gray. It has hue of 10YR, value of 3 to 5, and chroma of 1 or less. Reaction is slightly or moderately alkaline. The soil is noncalcareous in the matrix.

The B horizon is gray, grayish brown, dark grayish brown, or dark gray clay. It has hue of 10YR, value of 4 to 6, and chroma of 1 to 6. Mottles in shades of brown or yellow range from few to common and increase in size and number with depth. Concretions of calcium carbonate range from none to common.

The 2B horizon is below a depth of 60 inches. It is yellowish brown, light brown, pale brown, very pale brown, light gray, or gray and has various amounts of grayish or brownish mottles. Some pedons do not have a 2B horizon.

Burlewash Series

The Burlewash series consists of moderately deep, well drained, loamy soils on uplands. These soils formed in weakly to strongly cemented tuffaceous sandstone or siltstone. Slopes range from 2 to 45 percent.

Typical pedon of Burlewash fine sandy loam, 2 to 5 percent slopes; in La Grange, from the intersection of U.S. Highway 77 and Texas Highway 71, 11.6 miles north on U.S. Highway 77, 0.5 mile east on dirt road to gate, and 300 feet east along fence line.

A—0 to 4 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak fine granular structure; slightly hard, friable; many very fine and fine roots; 3 percent siliceous pebbles; very strongly acid; abrupt smooth boundary.

Bt1—4 to 9 inches; reddish brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) moist; many medium distinct dark red (2.5YR 3/6) mottles; strong fine subangular blocky structure; extremely hard, very firm; common very fine and fine roots; few fine pores; few thin clay films on faces of peds; very strongly acid; clear wavy boundary.

Bt2—9 to 19 inches; brown (7.5YR 5/4) clay, dark brown (7.5YR 4/4) moist; common medium prominent dark red (2.5YR 3/6) mottles; strong fine subangular blocky structure; extremely hard, very firm; few very fine and fine roots; common thin clay films on faces of peds; very strongly acid; clear wavy boundary.

BC—19 to 26 inches; light brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) moist; common medium prominent red (2.5YR 4/6) mottles; moderate medium angular blocky structure; very hard, very firm; few very fine and fine roots; few crystals of barite; very strongly acid; abrupt smooth boundary.

Cr—26 to 40 inches; very pale brown (10YR 7/4) and brown (10YR 5/3) weakly cemented tuffaceous sandstone, same color moist; common medium distinct strong brown (7.5YR 5/6) lenses; common medium prominent black (10YR 2/1) stains on faces of sandstone; massive; few roots between fractures and along bedding planes; very strongly acid.

The thickness of the solum ranges from 20 to 40 inches. Base saturation in the argillic horizon ranges from 35 to 75 percent and the COLE exceeds 0.09 in the upper Bt horizons.

The A horizon is grayish brown, light brownish gray, pale brown, or brown. It has hue of 10YR, value of 5 to 7, and chroma of 2 or 3. It is fine sandy loam or very gravelly fine sandy loam. Some pedons have an A2 horizon that has hue of 10YR, value of 5 to 7, and chroma of 2 or 3. Reaction ranges from very strongly acid to moderately acid.

The Bt horizon is brown, light brown, reddish brown, red, dark reddish brown, reddish yellow, or yellowish red. It has hue of 2.5YR to 7.5YR, value of 3 to 6, and chroma of 2 to 6. Mottles in shades of red, brown, or yellow are in some pedons. The texture is clay or sandy clay. Reaction ranges from extremely acid to strongly acid.

The BC horizon is light brown, pale brown, light brownish gray, or grayish brown. It has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 4. Mottles in shades of brown, red, or yellow are common throughout. The texture is clay, clay loam, or sandy clay loam. Reaction is very strongly acid or strongly acid.

The Cr horizon is thinly bedded and stratified mixtures of tuffaceous sandstone or siltstone in shades of gray, brown, or yellow. Reaction ranges from extremely acid to moderately acid.

Cadell Series

The Cadell series consists of deep, moderately well drained, loamy soils on uplands. They formed in tuffaceous alkaline clayey sediments interbedded with loamy and shaly materials. Slopes range from 1 to 3 percent.

Typical pedon of Cadell very fine sandy loam, 1 to 3 percent slopes; in Muldoon, from the intersection of Farm Road 2237 and Farm Road 154, 2.3 miles west on Farm Road 2237, 1,000 feet north on oil field road, and 75 feet east in rangeland.

A—0 to 5 inches; light brownish gray (10YR 6/2) very fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; very hard, firm; common fine and medium roots; few fine pores; slightly acid; abrupt wavy boundary.

Bt1—5 to 17 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; few fine and medium distinct reddish brown (5YR 4/4) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; extremely hard, very firm; common fine roots; few pressure faces; common thick dark grayish brown clay films on faces of peds; thin coatings of clean sand grains on vertical surfaces of most prisms; thin layer of sandy clay loam on top of prisms; few fine black concretions; few thin vertical streaks of loamy material; neutral; clear wavy boundary.

Bt2—17 to 24 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; common fine and medium distinct yellowish brown (10YR 5/4) mottles; moderate medium prismatic structure parting to moderate coarse angular blocky; extremely hard, very firm; common fine roots; few pressure faces; common thick discontinuous gray clay films on faces of peds; common streaks of clean sand on faces of peds; few thin vertical streaks of loamy material; slightly alkaline; clear wavy boundary.

Bk—24 to 35 inches; pale brown (10YR 6/3) clay, brown (10YR 5/3) moist; common medium faint grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; very hard, firm; few fine roots; few fine pores; few fine dark concretions; 5 percent concretions and soft masses of calcium carbonate; strongly effervescent; slightly alkaline; gradual wavy boundary.

B/2Ck—35 to 43 inches; pale yellow (5Y 7/3) clay, pale olive (5Y 6/3) moist; common medium distinct grayish brown (10YR 5/2) and few fine and medium distinct pale yellow (2.5Y 7/4) mottles (B); moderate medium angular blocky structure; very hard, firm; few fine roots; common fine pores; 10 percent concretions and soft masses of calcium carbonate; common clusters of gypsum crystals; few fine masses of barite; weathered shale fragments make up 20 percent of the lower part (C); strongly effervescent; slightly alkaline; diffuse wavy boundary.

2Cy—43 to 60 inches; pale olive (5Y 6/3) tuffaceous clay, pale olive (5Y 6/3) moist; few fine and medium distinct brownish yellow (10YR 6/6, 6/8)

mottles; massive; stratified with distinct cleavage planes; few thin strata of fine sandy loam; very hard, firm; common clusters of gypsum crystals; few fine masses of barite; few concretions of calcium carbonate in upper part of horizon; slightly alkaline; clear wavy boundary.

2C—60 to 80 inches; light gray (2.5Y 7/2) tuffaceous clay, light brownish gray (2.5Y 6/2) moist; common fine and medium distinct olive yellow (2.5Y 6/6) mottles; massive; stratified with distinct cleavage planes; very hard, very firm; neutral.

The thickness of the solum ranges from about 40 to 60 inches. The boundary between the A and Bt horizons is abrupt and ranges from smooth to wavy. Wet mottles in shades of gray are within a depth of 10 to 30 inches. The COLE is commonly greater than 0.07 in the argillic horizon, but the potential linear extensibility is less than 6 centimeters in the upper 50 inches of the soil. Salts, including gypsum or calcium carbonate, are within a depth of 14 to 28 inches. The exchangeable sodium ranges from 3 to 12 percent in the upper 16 inches of the argillic horizon. Siliceous pebbles range from none to about 5 percent throughout.

The A horizon is brown, grayish brown, yellowish brown, light yellowish brown, pale brown, or light brownish gray. It has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2 to 4. Reaction is slightly acid or neutral.

The Bt horizon is brown, dark brown, pale brown, grayish brown, dark grayish brown, or light brownish gray and has few or common mottles in shades of red, brown, gray, or olive. It has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 2 to 4. The texture is clay loam, silty clay, or clay. Content of clay ranges from 35 to 50 percent. The upper part of the Bt horizon typically is more clayey than the lower part. Reaction ranges from slightly acid to slightly alkaline. In most pedons, a thin coating of loam or sandy clay loam is at the top of the Bt horizon.

The Bk horizon is grayish brown, light brownish gray, light gray, very pale brown, pale yellow, or pale brown. Mottles in shades of gray, brown, or yellow are in some pedons. The Bk horizon has hue of 10YR to 2.5Y, value of 5 to 7, and chroma of 2 or 4. The texture is clay, clay loam, or silty clay loam. Calcium carbonate, gypsum, or barite concretions range from 3 to 10 percent. Reaction is slightly alkaline or moderately alkaline. The matrix can be calcareous or noncalcareous.

The B/2Ck horizon is light brownish gray, light gray, pale yellow, pale olive, light olive brown, or yellowish brown. Mottles in shades of gray, brown, or yellow are in some pedons. This horizon has hue of 10YR to 5Y, value of 5 to 7, and chroma of 2 or 4. The texture is clay, clay loam, or silty clay loam. Shale or siltstone fragments make up as much as 30 percent. Concretions or masses of calcium carbonate, gypsum and barite combined, range from 3 to 20 percent. Reaction is slightly alkaline or moderately alkaline. The matrix can be calcareous or noncalcareous.

The 2C horizon is tuffaceous clayey sediments interbedded with loamy and shaly materials in shades of gray, yellow, and brown. The texture is clay loam, silty clay, or clay. Masses of calcium carbonate, gypsum, and barite range from few to common in the upper part of the horizon. Reaction ranges from neutral to moderately alkaline. It is noncalcareous in most pedons.

Carbengle Series

The Carbengle series consists of moderately deep, well drained, loamy soils on uplands. These soils formed in weakly cemented calcareous sandstone. Slopes range from 3 to 12 percent.

Typical pedon of Carbengle sandy clay loam, 3 to 5 percent slopes; in La Grange, from the intersection of Texas Highway 71 and Texas Highway 159, 6.4 miles east on Texas Highway 159, 1.0 mile west and south on county road past Park Community, 0.7 mile west and south on private (LCRA) road, and 550 feet southwest in rangeland.

A—0 to 10 inches; dark grayish brown (10YR 4/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; slightly hard, friable; many fine and medium roots; few wormcasts and channels; few fragments of snail shells; few siliceous pebbles; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—10 to 21 inches; light yellowish brown (10YR 6/4) loam, yellowish brown (10YR 5/4) moist; moderate fine subangular blocky structure; slightly hard, friable; few fine roots; few fine pores; few wormcasts and channels; common soft masses of calcium carbonate; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—21 to 33 inches; very pale brown (10YR 7/4) clay loam, yellowish brown (10YR 6/4) moist; moderate fine subangular blocky structure; slightly hard, very friable; few fine roots; few fine pores; few wormcasts and channels; common soft masses, films, and threads of calcium carbonate; few fine hard masses of weakly consolidated sandstone; violently effervescent; moderately alkaline; gradual smooth boundary.

Cr—33 to 40 inches; white (10YR 8/2) and very pale brown (10YR 7/3), weakly cemented platy

sandstone; loamy material and few roots between plates; violently effervescent; moderately alkaline.

The thickness of the solum ranges from 20 to 40 inches over cemented sandstone. Calcium carbonate equivalent ranges from 40 to 55 percent in the Bk horizons.

The A or Ap horizon is brown, dark gray, dark grayish brown, dark brown, or very dark grayish brown. It has hue of 10YR, value of 3 or 4, and chroma of 1 to 3. The texture is sandy clay loam or loam.

The Bk1 horizon is grayish brown, very pale brown, pale brown, light yellowish brown, or light brownish gray. It has hue of 10YR, value of 5 to 7, and chroma of 2 to 4. The texture is loam or clay loam.

The Bk2 horizon is light gray, light brown, light yellowish brown, pale brown, or very pale brown. It has hue of 7.5YR to 2.5Y, value of 6 or 7, and chroma of 2 to 4. The texture is loam or clay loam.

The Cr horizon ranges from weakly cemented sandstone to strongly cemented sandstone that is interbedded with loamy sediments. It can be cut with a spade or auger. Roots penetrate only in fractures and in loamy interbedded material.

Carmine Series

The Carmine series consists of very deep, moderately well drained, gravelly, loamy soils that formed in stratified loamy, clayey, and siliceous gravel deposits (fig. 22). These soils are on Quaternary terraces. Slopes range from 2 to 5 percent.

Typical pedon of Carmine extremely gravelly very fine sandy loam, 2 to 5 percent slopes; in Round Top, from the intersection of Texas Highway 237 and County Road 111, 5.1 miles west on County Road 111, 0.6 mile southwest on oil field road, 360 feet east along fence line, and 25 feet north in rangeland.

A—0 to 7 inches; light yellowish brown (10YR 6/4) extremely gravelly very fine sandy loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, very friable; common very fine, fine, and medium roots; common very fine and fine pores; 65 percent siliceous pebbles; slightly acid; clear wavy boundary.

AE—7 to 14 inches; pink (7.5YR 7/4) extremely gravelly very fine sandy loam, strong brown (7.5 YR 4/6) moist; weak fine granular structure; slightly hard, very friable; common very fine and fine roots; common fine and medium pores; 65 percent siliceous pebbles; slightly acid; clear smooth boundary.

E—14 to 36 inches; pink (7.5 YR 7/4) extremely gravelly loamy coarse sand, brown (7.5YR 5/4) moist; single grain; slightly hard, very friable; few very fine and fine roots; common fine and medium pores; common strata of sandy material as much as 1 inch thick; 70 percent siliceous pebbles; slightly acid; abrupt wavy boundary.

2Bt1—36 to 47 inches; light gray (10YR 7/2) very gravelly sandy clay loam, light brownish gray (10YR 6/2) moist; many coarse prominent dark red (2.5YR 3/6) and medium reddish yellow (7.5YR 6/8) mottles; weak medium subangular blocky structure; very hard, very firm; many thick discontinuous clay films on faces of peds; 35 percent siliceous pebbles, 5 percent cobbles; extremely acid; abrupt wavy boundary.

2Bt2—47 to 60 inches; light gray (10YR 7/2) very gravelly sandy clay loam, light brownish gray (10YR 6/2) moist; many coarse prominent red (2.5YR 4/8) and few medium reddish yellow (7.5YR 6/8) mottles; weak medium subangular blocky structure; very hard, very firm; common fine and medium roots; common thick discontinuous clay films on faces of peds; common discontinuous horizontal strata of sandy materials as much as 1 inch thick; 40 percent siliceous pebbles; extremely acid; abrupt wavy boundary.

3Bt3—60 to 65 inches; light gray (2.5Y 7/2) sandy clay loam, light brownish gray (10YR 6/2) moist; common fine distinct gray (5Y 5/1) and few fine and medium prominent red (2.5YR 4/6) mottles; weak coarse subangular blocky structure parting to weak medium angular blocky; hard, firm; common fine and medium roots; many thin continuous clay films on faces of peds; very strongly acid; clear smooth boundary.

3BCt—65 to 80 inches; white (2.5Y 8/2) sandy clay loam, gray (5Y 5/1) moist; common coarse distinct light gray (2.5Y 7/2) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; hard, firm; few fine roots in cracks; very strongly acid.

The thickness of the solum ranges to more than 80 inches. The combined thickness of the A, AE, and E horizons ranges from 20 to 40 inches. The content of clay in the control section ranges from 20 to 35 percent. Rounded siliceous pebbles and cobbles are on the surface and in the A, AE, E, and upper Bt horizons. They average more than 60 percent in the A, AE, and E horizons and more than 35 percent in the particle-size control section. Cobbles average less than 5 percent in the surface horizon.

The A horizon is brown, dark brown, light brown, dark yellowish brown, light yellowish brown, very pale brown, or yellowish brown. It has hue of 7.5YR or 10YR, value of 4 to 7, and chroma of 3 or 4. Clay

content ranges from 4 to 10 percent. Reaction ranges from very strongly acid to slightly acid.

The AE horizon is reddish yellow, brownish yellow, pink, or yellow. It has hue of 7.5YR or 10YR, value of 6 or 7, and chroma of 4 to 8. Content of clay ranges from 2 to 5 percent. Reaction ranges from very strongly acid to slightly acid.

The E horizon is light brown, pale brown, light yellowish brown, or pink. It has hue of 7.5YR or 10YR, value of 6 or 7, and chroma of 3 or 4. Content of clay ranges from 2 to 5 percent. Reaction ranges from very strongly acid to slightly acid. About 2 to 10 percent of the volume of the coarse fraction is composed of cobbles, mainly less than 5 inches across the long axis.

The 2Bt horizon is brown, dark brown, dark grayish brown, grayish brown, light brown, light olive brown, olive brown, light yellowish brown, pale brown, strong brown, yellowish brown, very pale brown, light gray, light brownish gray, pinkish gray, pink, pale yellow, reddish yellow, or yellow. It has hue of 7.5YR to 2.5Y, value of 4 to 7, and chroma of 2 to 6. Mottles in shades of brown, gray, red, or yellow range from few to many. Content of clay ranges from 20 to 35 percent. Coarse fragments range from 35 to 55 percent. Reaction ranges from extremely acid to strongly acid.

The 3Bt and 3BCt horizons are brown, grayish brown, light yellowish brown, pale brown, very pale brown, gray, light gray, light brownish gray, light olive gray, olive gray, olive, pale olive, pale yellow, or white. They have hue of 10YR to 5Y, value of 5 to 8, and chroma of 1 to 4. Mottles in shades of gray, brown, red, or yellow range from few to many. Content of clay ranges 20 to 35 percent. Coarse fragment content ranges from none to 15 percent. Reaction ranges from extremely acid to slightly acid.

Chazos Series

The Chazos series consists of very deep, moderately well drained, sandy soils on Pleistocene terraces. These soils formed in loamy and clayey sediments. Slopes range from 1 to 3 percent.

Typical pedon of Chazos loamy fine sand, 1 to 3 percent slopes; in Muldoon, from the intersection of Farm Road 2237 and Farm Road 154, 3.9 miles south on Farm Road 154 to county road, 1.6 miles west on county road, 0.5 mile north on county road, 2.4 miles west on county road, and 180 feet south in rangeland.

A—0 to 9 inches; light yellowish brown (10YR 6/4) loamy fine sand, yellowish brown (10YR 5/4) moist; weak fine granular structure; loose, friable; many fine, medium, and coarse roots; slightly acid; gradual wavy boundary.

E—9 to 13 inches; very pale brown (10YR 7/4) loamy fine sand, yellowish brown (10YR 5/4) moist; weak fine granular structure; loose, friable; many fine, medium, and coarse roots; slightly acid; abrupt wavy boundary.

Bt1—13 to 23 inches; mottled brownish yellow (10YR 6/6) and light gray (10YR 7/2) clay; few medium prominent red (2.5YR 4/6) mottles; moderate coarse prismatic structure parting to moderate medium angular blocky; very hard, very firm; many fine, medium and few coarse roots; few thin gray (10YR 6/1) clay coatings on faces of peds; few brown (10YR 5/3) sand coatings on faces of prisms; few siliceous pebbles; few fine black concretions; slightly acid; clear wavy boundary.

Bt2—23 to 31 inches; reddish brown (5YR 5/4) clay, reddish brown (5YR 4/4) moist; many medium prominent light brownish gray (10YR 6/2) and common medium faint reddish gray (5YR 5/2) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, very firm; common fine and medium roots; thick gray (10YR 6/1) clay coatings on faces of peds; few fine black concretions; neutral; gradual wavy boundary.

Bt3—31 to 45 inches; light brownish gray (2.5Y 6/2) sandy clay loam, grayish brown (2.5Y 5/2) moist; common medium prominent yellowish red (5YR 5/6) and common medium distinct brown (10YR 5/3) mottles; moderate medium subangular blocky structure; hard, firm; few fine and medium roots; thick gray (10YR 6/1) clay coats on faces of peds; common black splotches; few fine black concretions; few concretions of calcium carbonate in lower part; neutral; gradual wavy boundary.

BC1—45 to 60 inches; light yellowish brown (10YR 6/4) sandy clay loam, yellowish brown (10YR 5/4) moist; common fine prominent red (2.5YR 4/8) mottles; weak fine and medium subangular blocky structure; slightly hard, firm; few fine roots; few light brownish gray (2.5Y 6/2) clay coatings on faces of peds; slightly effervescent; moderately alkaline; diffuse wavy boundary.

BC2—60 to 74 inches; stratified very pale brown (10YR 7/3) fine sandy loam, yellow (10YR 7/6) sandy clay loam and light yellowish brown (2.5Y 6/4) weakly consolidated sandstone; common fine and medium red (2.5YR 5/8) mottles; massive; hard, firm; few thin strata of light brownish gray (10YR 6/2) clay; few fine concretions of calcium carbonate; slightly effervescent; moderately alkaline.

The thickness of the solum ranges from 42 to 60 inches. Fine siliceous pebbles occur throughout some pedons.

The combined thickness of the A and E horizons ranges from 10 to 20 inches. The A or Ap horizon is brown, dark grayish brown, light yellowish brown, or pale brown. It has hue of 10YR, value of 4 to 6, and chroma of 2 to 4. The E horizon is pale brown, very pale brown, or brown. It has hue of 10YR, value of 5 to 7, and chroma of 3 or 4. Reaction is moderately or slightly acid in both horizons.

The Bt1 horizon is brownish yellow, pale brown, red, reddish brown, or light gray. It has hue of 2.5YR to 10YR, value of 4 to 6, and chroma of 2 to 6. Mottles are common in shades of yellow, brown, gray, and red. The texture is clay or sandy clay, averaging between 35 to 50 percent clay. Reaction is moderately acid or slightly acid.

The Bt2 and Bt3 horizons are reddish brown, reddish yellow, light brownish gray, or yellowish brown. They have hue of 2.5YR to 10YR, value of 4 to 6, and chroma of 2 to 8. Mottles are red, gray, brown, and yellow. Content of clay ranges from 35 to 50 percent. Reaction is moderately acid to neutral.

The BC horizons are in shades of brown, yellow, and olive. They have hue of 10YR to 5Y, value of 5 to 7, and chroma of 3 to 8. Mottles range from few to common and are in shades of gray, red, yellow, and brown. The texture is fine sandy loam, sandy clay loam, clay loam, or clay. Reaction is neutral to moderately alkaline.

Some pedons have a C horizon in shades of brown, yellow, gray, and olive. It has hue of 10YR to 5Y, value of 6 to 8, and chroma of 1 to 3. Mottles range from few to common and are in shades of gray, red, yellow, and brown. The texture is sandy clay loam, clay loam, or clay. Reaction is neutral to moderately alkaline.

Coarsewood Series

The Coarsewood series consists of very deep, well drained, loamy soils. These soils formed in calcareous, loamy alluvial sediments. They are on nearly level flood plains. Slopes range from 0 to 2 percent.

Typical pedon of Coarsewood silt loam, occasionally flooded; in La Grange, from the intersection of U.S. Highway 77 and Texas Highway 71, 10.7 miles southeast on Texas Highway 71, 0.5 mile southwest on county road, about 0.5 mile southeast, about 1.5 miles southwest on private road to cattle guard, 0.5 mile south and southwest on pasture road, and 215 feet northwest of road in pasture.

Ap—0 to 7 inches; brown (7.5YR 5/4) silt loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; loose, friable; many fine and common medium roots; many fine, medium, and coarse pores; few snail shells; strongly effervescent; slightly alkaline; abrupt smooth boundary.

Bw1—7 to 16 inches; reddish brown (5YR 5/3) silt loam, reddish brown (5YR 4/3) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky structure; slightly hard, friable; many fine and common medium roots; many fine, medium and coarse pores; few snail shells; violently effervescent; slightly alkaline; clear smooth boundary.

Bw2—16 to 25 inches; brown (7.5YR 5/4) silt loam, brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, firm; many fine and common medium roots; many fine, medium and coarse pores; few snail shells; common thick continuous iron manganese stains on vertical ped faces; common wormcasts; common krotovinas; violently effervescent; slightly alkaline; gradual smooth boundary.

Bw3—25 to 37 inches; brown (7.5YR 5/4) silt loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, firm; common fine roots; common fine, medium, and coarse pores; few snail shells; common wormcasts in pockets; common thick iron manganese stains on vertical ped faces; many thin lenses of yellowish brown (10YR 5/4) silt loam; violently effervescent; slightly alkaline; clear wavy boundary.

Ab—37 to 45 inches; reddish brown (5YR 5/3) silt loam, reddish brown (5YR 4/3) moist; moderate medium subangular blocky structure parting to moderate fine and medium subangular blocky; hard, friable; many fine roots; many fine and medium pores; few snail shells; common thick continuous iron manganese stains on vertical ped faces; violently effervescent; slightly alkaline; clear smooth boundary.

Bwb—45 to 64 inches; light brown (7.5YR 6/4) very fine sandy loam, brown (7.5YR 5/4) moist; weak medium subangular blocky structure; slightly hard, friable; common fine roots; common fine and medium pores; few snail shells; few wormcasts; discontinuous strata of brown (7.5YR 4/4) silt loam; few cross-bedded strata; violently effervescent; slightly alkaline; clear smooth boundary.

C—64 to 80 inches; light yellowish brown (10YR 6/4) very fine sandy loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, friable; few fine roots; many fine and medium pores; few snail shells; few wormcasts; many very fine strata of loamy and sandy materials; violently effervescent; slightly alkaline.

The thickness of the solum ranges from 30 to more than 60 inches and corresponds to the depth of

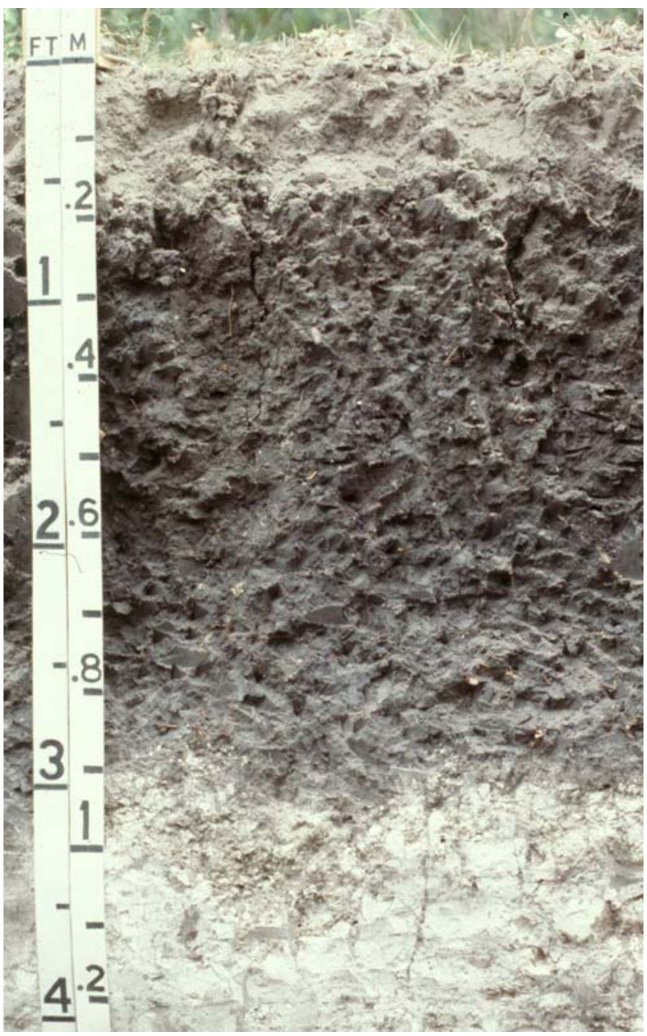

Figure 20.—A profile of Arol fine sandy loam. The subsoil is very dense, and it is underlain by weakly cemented tuffaceous material at a depth of about 3 feet.

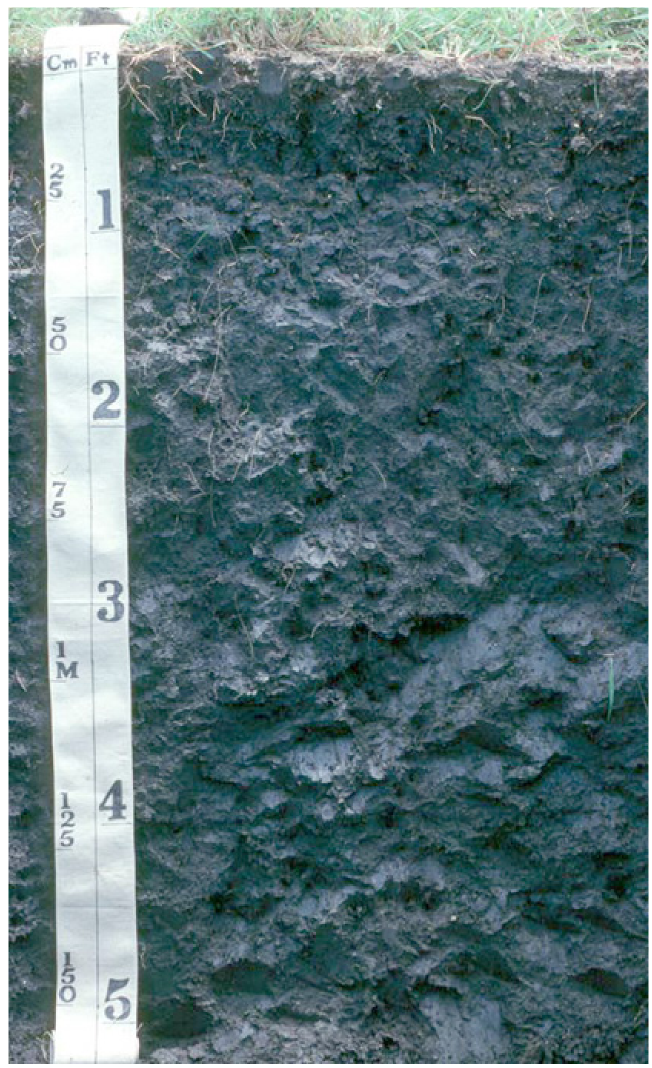

Figure 21.—A profile of Branyon clay. Slickensides begin at a depth of about 16 inches. They are a result of soil movement.

unweathered strata of loamy and sandy materials. The 10- to 40-inch control section contains less than 18 percent clay and less than 15 percent sand more coarse than very fine sand. Fragments of snail shells range from none to common.

The A horizon is dark reddish brown, dark reddish gray, reddish brown, reddish gray, very dark grayish brown, dark yellowish brown, brown, dark grayish brown, grayish brown, and yellowish brown. It has hue of 5YR to 10YR, value of 4 to 6, and chroma of 2 to 4. Where the A horizon has moist chroma and value of 3.5 or less, it is less than 10 inches thick.

The Bw horizons are reddish brown, yellowish red, light reddish brown, reddish yellow, brown, strong brown, and light brown. They have hue of 5YR or 7.5YR, value of 5 or 6, and chroma of 3 to 6. The texture is silt loam, loam, or very fine sandy loam. Thin stratifications of sandy material are in some pedons. Some pedons have a few threads and fine concretions of calcium carbonate in the lower Bw horizons and some have buried horizons that are darker in color below a depth of about 26 inches.

The C horizon is in shades of red, brown, and yellow. It has hue of 5YR to 10YR, value of 5 to 7, and chroma of 3 to 6. The texture is thinly and coarsely stratified very fine sandy loam, fine sandy loam, silt loam, or loamy very fine sand and may include thin strata of coarser or finer materials. Within the control section, the cumulative thickness of layers containing more than 18 percent clay is less than 8 inches. Some pedons contain a few threads and fine concretions of calcium carbonate.

Crockett Series

The Crockett series consists of deep, moderately well drained, loamy soils on uplands. These soils formed in alkaline shales and clays. Slopes range from 1 to 3 percent.

Typical pedon of Crockett loam, 1 to 3 percent slopes; in Cistern, from the intersection of Texas Highway 95 and Farm Road 2237, 1.7 miles east on Farm Road 2237, 3.9 miles north on county road, and 125 feet west of county road in rangeland.

A—0 to 9 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; common fine and medium faint yellowish brown (10YR 5/4) mottles; weak fine subangular blocky structure; hard, firm; many fine roots; common fine and medium pores; few wormcasts and channels; slightly acid; abrupt wavy boundary.

Bt1—9 to 16 inches; brown (10YR 5/3) clay, brown (10YR 4/3) moist; common fine and medium distinct reddish brown (5YR 4/4) and few medium distinct and faint yellowish brown (10YR 5/4, 5/6) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; extremely hard, very firm; common fine roots; common clay films on faces of prisms; loamy material in cracks on faces of prisms; few fine ironstone pebbles; few fine black concretions; slightly acid; gradual wavy boundary.

Bt2—16 to 29 inches; light olive brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; few medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium and coarse angular blocky; extremely hard, very firm; few fine roots; common clay films on faces of peds; common pressure faces; vertical cracks between prisms filled with very dark grayish brown (10YR 3/2) loamy material; few fine ironstone fragments; few fine black concretions; slightly alkaline; gradual wavy boundary.

Btk—29 to 42 inches; brownish yellow (10YR 6/6) clay loam, yellowish brown (10YR 5/6) moist; few fine distinct reddish yellow mottles; moderate medium angular blocky structure; very hard, very firm; few fine roots; common thin clay films on faces of peds; common coarse calcium carbonate concretions; few gypsum crystals; few fine ironstone fragments; moderately alkaline; gradual wavy boundary.

BC—42 to 47 inches; brownish yellow (10YR 6/6) clay loam, yellowish brown (10YR 5/6) moist; common medium prominent reddish yellow (7.5YR 6/8) mottles; weak medium angular blocky structure; very hard, very firm; few fine roots; few masses of gypsum crystals; 5 to 8 percent ironstone pebbles; few vertical cracks filled with dark brown loamy material; few lenses of white (10YR 8/1) weakly cemented sandstone and strong brown (7.5YR 5/6) clay; moderately alkaline; gradual wavy boundary.

Cy1—47 to 62 inches; stratified light gray (2.5Y 7/2) clay, light brownish gray (2.5Y 6/2) moist; common medium distinct yellowish brown (10YR 5/8) mottles; massive; extremely hard, very firm; few fine roots; many coarse masses of gypsum crystals and white salts; few medium calcium carbonate concretions; few fine ironstone fragments; moderately alkaline; gradual wavy boundary.

Cy2—62 to 74 inches; stratified light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; common coarse brownish yellow (10YR 6/8) mottles; massive; extremely hard, very firm; common coarse masses of gypsum crystals and white salts; few fine calcium carbonate masses;

Figure 22.—A profile of Carmine extremely gravelly very fine sandy loam. The clayey subsoil, which contains a large amount of gravel and a few cobbles, begins at a depth of about 36 inches.

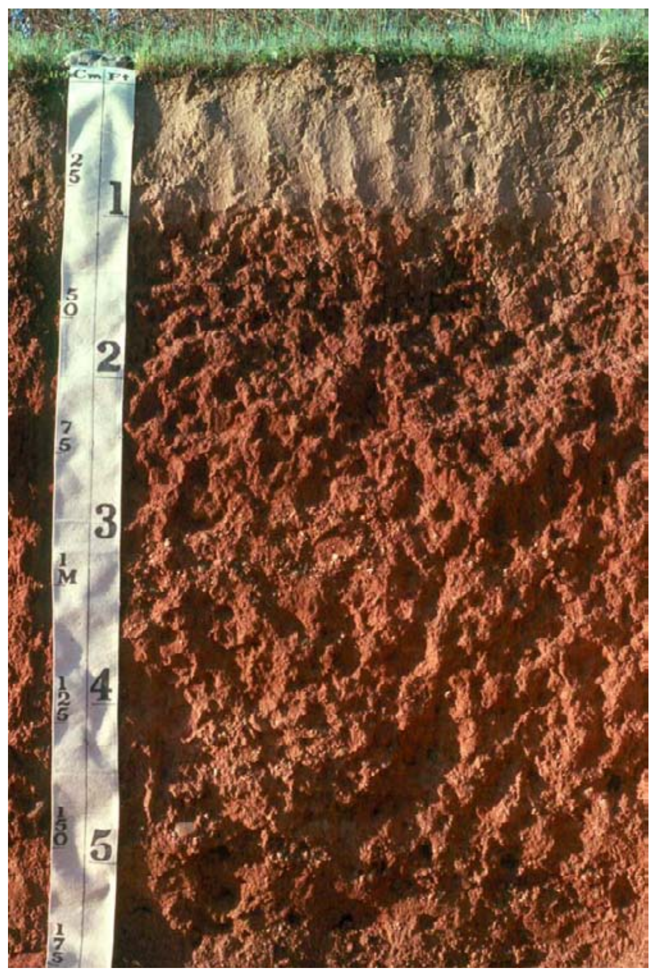

Figure 23.—A profile of Knolle fine sand. The sandy clay loam subsoil has prismatic structure and decreases in clay content with depth.

Figure 24.—A profile of Renish fine sandy loam. This dark colored, shallow soil is underlain by sandstone at a depth of about 11 to 15 inches.

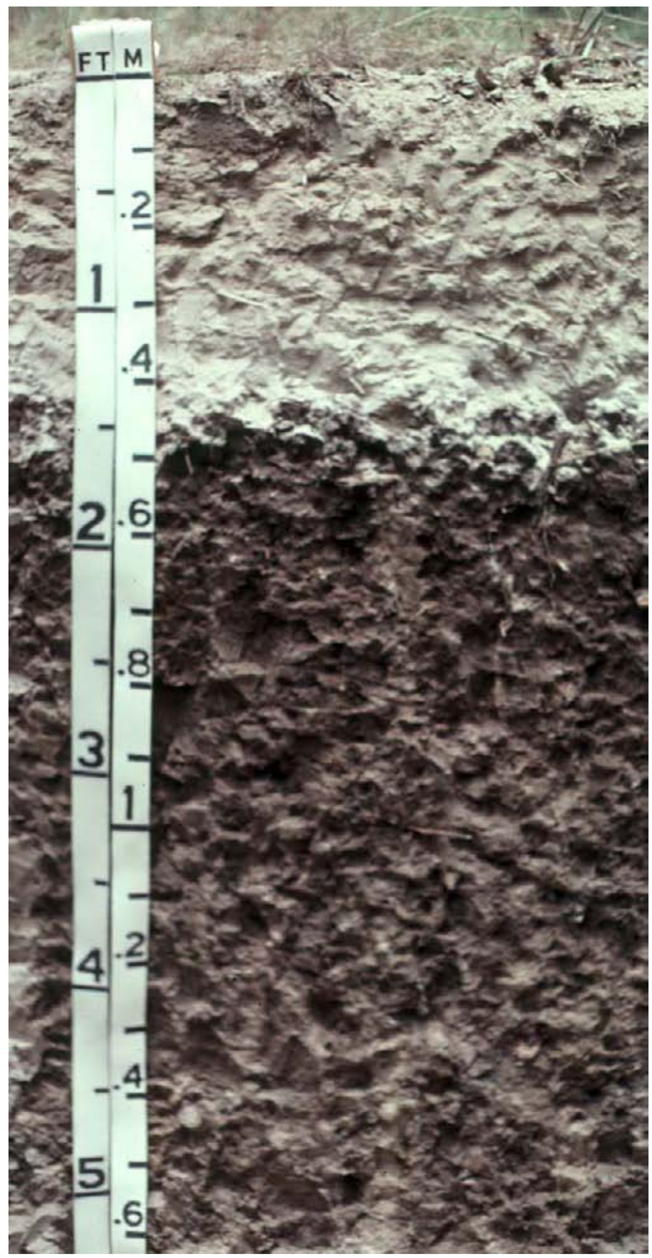

Figure 25.—A profile of Rutersville loamy fine sand. Water perches on the dense, 6-inch-thick upper part of the subsoil after periods of heavy rain.

Figure 26.—A profile of an eroded phase of Shalba fine sandy loam. The substratum is moderately cemented tuffaceous material underlain by Wellborn sandstone.

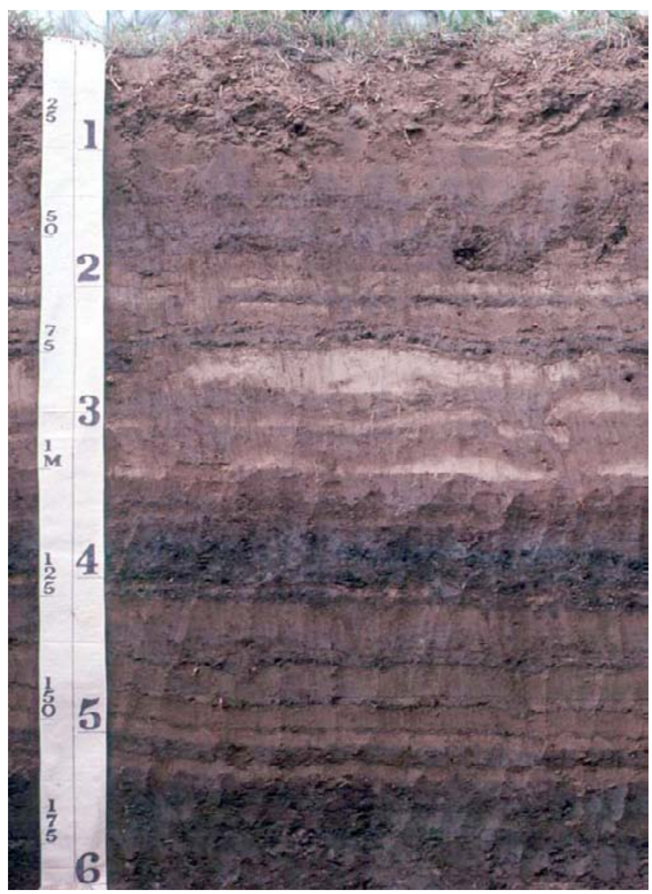

Figure 27.—A Profile of Weswood loam. The subsoil is stratified with sandy, loamy, and clayey calcareous materials.

few fine ironstone pebbles; moderately alkaline; gradual wavy boundary.

Cy3—74 to 80 inches; stratified yellowish brown (10YR 5/8) clay, yellow brown (10YR 5/6) moist; massive; hard, firm; common fine gypsum crystals; few fine ironstone pebbles; moderately alkaline.

The thickness of the solum ranges from 44 to more than 60 inches. Depth to secondary carbonates ranges from 28 to more than 60 inches. When dry, cracks 0.5 inch to about 2 inches wide extend from the top of the Bt horizon to a depth of 2 to 5 feet. The average content of clay in the control section is 40 to 50 percent and the COLE ranges from 0.07 to 0.1.

The A horizon is brown, yellowish brown, or dark grayish brown. It has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. Reaction is moderately acid or slightly acid.

The Bt1 horizon is in shades of brown, red, or yellow or is mottled in these colors. The Bt horizon has hue of 10YR to 5YR, value of 4 to 6, and chroma of 2 to 6. Gypsum crystals and calcium carbonate concretions are in the lower part of the Bt1 horizon of some pedons. Reaction is slightly acid or neutral.

The Bt2 horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 6. Gypsum crystals, salts, and calcium carbonate concretions range from few to many.

The Btk and BC horizons are light olive brown or brownish yellow. They have hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 8. Mottles in shades of gray, brown, and olive range from few to common. The texture is clay or clay loam. Gypsum crystals and concretions of calcium carbonate range from few to common. Some pedons consist of as much as 10 percent ironstone pebbles and fragments.

The Cy horizons are in shades of brown, yellow, olive, or gray. They have hue of 10YR or 2.5Y, value of 6 or 7, and chroma of 2 to 8. Mottles in shades of matrix colors are common. The texture is clay loam or clay. Ironstone pebbles range from 0 to 5 percent. Gypsum crystals range from few to many. Concretions of calcium carbonate range from few to common.

Degola Series

The Degola series consists of very deep, well drained, loamy soils on flood plains. These soils formed in loamy alluvium. Slopes are 0 to 1 percent.

Typical pedon of Degola loam, occasionally flooded; in La Grange, from the intersection of Texas Highway 71 and Texas Highway 159, 6.6 miles north on Texas Highway 159, 5.0 miles north on Texas Highway 237, 4.2 miles east on Farm Road 954, and 230 feet south in pasture.

A1—0 to 12 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak coarse angular blocky structure; soft, friable; many very fine and fine roots; few fine pores; neutral; clear wavy boundary.

A2—12 to 26 inches; dark gray (10YR 4/1) sandy clay loam, very dark gray (10YR 3/1) moist; weak coarse subangular blocky structure; slightly hard, friable; few very fine and fine roots; few fine pores; neutral; gradual wavy boundary.

A3—26 to 36 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; moderate medium subangular blocky structure; slightly hard, friable; few very fine roots; neutral; clear wavy boundary.

C—36 to 42 inches; gray (10YR 5/1) sandy clay loam, dark grayish brown (10YR 4/2) moist; massive; hard, firm; few very fine roots; slightly effervescent; moderately alkaline; gradual wavy boundary.

Ck1—42 to 54 inches; gray (10YR 5/1) clay loam, dark grayish brown (10YR 4/2) moist; massive; hard, firm; common lenses and pockets of calcium carbonate; common pockets of light gray (2.5Y 7/2) material; violently effervescent; moderately alkaline; gradual wavy boundary.

Ck2—54 to 72 inches; gray (10YR 6/1) sandy clay loam, light gray (2.5Y 7/2) moist; massive; soft, friable; common lenses of calcium carbonate; common fine black and brown concretions; violently effervescent; moderately alkaline; abrupt wavy boundary.

The content of clay in the control section ranges from 22 to 35 percent. The combined thickness of the A horizons is more than 20 inches.

The A horizons are dark gray, grayish brown, dark grayish brown, very dark grayish brown, or dark brown. They have hue of 10YR, value 3 to 5, and chroma of 1 to 3. The texture is loam, sandy clay loam, or clay loam. Reaction ranges from slightly acid to slightly alkaline.

The C and Ck horizons are gray, light brownish gray, pale brown, or very pale brown. These horizons have hue of 10YR, value of 5 or 6, and chroma of 1 to 3. They are commonly stratified with layers of fine sandy loam, loam, sandy clay loam, or clay loam. Some pedons are not stratified and contain threads and concretions of calcium carbonate. Reaction ranges from neutral to moderately alkaline.

Denhawken Series

The Denhawken series consists of very deep, well drained, loamy soils on uplands. They formed in calcareous shaly and clayey sediments. Slopes range from 1 to 3 percent.

Typical pedon of Denhawken clay loam in an area of Elmendorf-Denhawken complex, 1 to 3 percent slopes; in Cistern, from the intersection of Farm Road 2237 and Texas Highway 95, 2.4 miles north on Texas Highway 95, and 175 feet west in rangeland.

A—0 to 7 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, very firm; common fine and medium roots; common fine hard concretions of calcium carbonate; common fine ironstone pebbles; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk1—7 to 20 inches; light olive brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; moderate medium prismatic structure parting to moderate fine and medium angular blocky; extremely hard, firm; common shiny ped faces; common fine hard concretions of calcium carbonate; few fine ironstone pebbles; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—20 to 33 inches; light olive brown (2.5Y 5/4) clay, same color moist; common medium distinct dark grayish brown (2.5Y 4/2) mottles; strong medium angular blocky structure; extremely hard, very firm; few fine roots; many fine hard concretions of calcium carbonate; few fine black concretions; few ironstone pebbles; common cracks filled with material from above; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk3—33 to 43 inches; light olive brown (2.5Y 5/6) clay, same color moist; common medium prominent dark grayish brown (2.5Y 4/2) and few fine distinct grayish brown (10YR 5/2) mottles; moderate medium angular blocky structure; extremely hard, very firm; few fine roots; many fine hard concretions of calcium carbonate; few fine black concretions; few ironstone pebbles; violently effervescent; moderately alkaline; gradual wavy boundary.

Bky—43 to 62 inches; mottled light olive brown (2.5Y 5/4 and 5/6) and light brownish gray (2.5Y 6/2) clay; moderate medium angular blocky structure; very hard, very firm; few fine roots; few shiny ped faces; common fine hard concretions of calcium carbonate; few fine black concretions; few fine gypsum crystals; few ironstone pebbles; common thin fragments of shale; violently effervescent; moderately alkaline; gradual wavy boundary.

Cy—62 to 80 inches; light olive gray (5Y 6/2) shale that has clay texture, same color moist; common medium prominent yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; massive; many cleavage planes; very hard, very firm; few fine roots; common pressure faces; many medium gypsum crystals; strongly effervescent; moderately alkaline.

The thickness of the solum ranges from 60 to 80 inches. When dry, cracks as much as 2 inches wide form at the surface and extend to a depth of 25 to 50 inches. The soil is calcareous and moderately alkaline throughout.

The A horizon is dark grayish brown, brown, or grayish brown. It has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3.

The Bk and Bky horizons are grayish brown, light brownish gray, yellowish brown, olive brown, light olive brown, or light yellowish brown. The Bk and Bky horizons have hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 6. The texture is clay or clay loam. Content of clay is 35 to 55 percent. Crystalline gypsum and other salts are common.

The Cy horizon is in shades of gray, brown, and yellow. Gypsum crystals range from common to many.

This soil is a taxadjunct to the Denhawken series because it is moist for a longer period during most years. Differences in interpretations are minor.

Dubina Series

The Dubina series consists of very deep, moderately well drained, sandy soils on uplands. These soils formed in loamy and sandy sediments. Slopes range from 2 to 5 percent.

Typical pedon of Dubina loamy fine sand, 2 to 5 percent slopes; in Schulenburg, from the intersection of U.S. Highway 90 and U.S. Highway 77, 4.5 miles east on U.S. Highway 90, 0.8 mile north on Farm Road 1383, and 1,200 feet east in pasture.

A—0 to 16 inches; dark brown (10YR 4/3) loamy fine sand, dark brown (10YR 3/3) moist; weak fine granular structure; loose, very friable; many fine and medium roots; few wormcasts and channels; slightly acid; abrupt wavy boundary.

Bt1—16 to 27 inches; brown (10YR 5/3) sandy clay, dark brown (10YR 4/3) moist; common medium prominent dark red (2.5YR 3/6) and common medium faint yellowish brown (10YR 5/4) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, very firm; common fine roots; common thick continuous very dark gray (10YR 3/1) clay films on exterior of some peds; few fine siliceous pebbles; slightly acid; gradual wavy boundary.

Bt2—27 to 54 inches; mottled reddish yellow (7.5YR 6/6), red (2.5YR 4/6), and light gray (2.5Y 7/2) sandy clay; moderate medium prismatic structure parting to weak medium subangular blocky; very

hard, firm; few fine roots; common thick continuous grayish brown (2.5Y 5/2) clay films on prism faces; few fine black concretions; few fine siliceous pebbles; slightly acid; clear wavy boundary.

BCt—54 to 70 inches; strong brown (7.5YR 5/6) sandy clay loam, strong brown (7.5YR 4/6) moist; common medium prominent light gray (2.5Y 7/2) and common medium distinct light yellowish brown (2.5Y 6/4) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; hard, friable; few fine roots; few fine pores; few very thin grayish brown (2.5Y 5/2) clay films on faces of prisms; few concretions of calcium carbonate in lower part; neutral; gradual smooth boundary.

BCk—70 to 80 inches; brownish yellow (10YR 6/6) fine sandy loam, yellowish brown (10YR 5/6) moist; massive; soft, very friable; common masses and concretions of calcium carbonate; strongly effervescent; moderately alkaline.

The thickness of the solum ranges to more than 60 inches. In some pedons, concretions and masses of calcium carbonate are below a depth of 36 inches. Some pedons contain a few siliceous pebbles.

The A horizon is very dark grayish brown, dark grayish brown, grayish brown, brown, or dark brown. It has hue of 10YR, value of 3 to 5, and chroma of 2 or 3. Reaction ranges from moderately acid to neutral. The A horizon is 8 to 20 inches thick.

The upper part of the Bt horizon is dark gray, dark grayish brown, grayish brown, brown, or dark brown with hue of 10YR, value of 4 or 5, and chroma of 1 to 3. It has common to many mottles in shades of brown, gray, red, and yellow. The texture is clay loam or sandy clay. Average content of clay in the control section ranges from 35 to 45 percent. Reaction is slightly acid or neutral.

The lower part of the Bt horizon is mottled reddish yellow, red, or light gray. It has hue of 2.5Y to 7.5YR, value of 4 to 7, and chroma of 2 to 6. It has mottles in shades of yellow, brown, gray, or red. The texture is sandy clay, clay loam, or sandy clay loam. Reaction ranges from slightly acid to moderately alkaline.

The BCt and BCk horizons are in shades of yellow or brown. They have hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. They contain common to many mottles in shades of yellow, brown, gray, or red. The texture is fine sandy loam or sandy clay loam. Reaction ranges from slightly acid to moderately alkaline.

Some pedons have a C horizon in shades of yellow, brown, or white. The texture is loamy sand, fine sandy loam, or sandy clay loam. Some pedons contain interbedded layers of weakly consolidated sandstone. Most pedons contain masses and concretions of calcium carbonate. Reaction is slightly or moderately alkaline.

Dutek Series

The Dutek series consists of very deep, well drained, sandy soils on uplands. These soils formed in loamy and sandy materials. Slopes range from 1 to 3 percent.

Typical pedon of Dutek loamy fine sand, 1 to 3 percent slopes; in La Grange, from the intersection of U.S. Highway 77 and Texas Highway 71, 1.5 miles south on U.S. Highway 77, 4.3 miles southeast on Farm Road 155, 0.4 mile north on field road, and 900 feet east in bermudagrass meadow.

A—0 to 18 inches; pale brown (10YR 6/3) loamy fine sand, dark brown (10YR 4/3) moist; weak fine granular structure; loose, very friable; common fine and medium roots; few fine pores; moderately acid; gradual smooth boundary.

E—18 to 26 inches; light yellowish brown (10YR 6/4) loamy fine sand, dark yellowish brown (10YR 4/4) moist; weak fine granular structure; loose, very friable; common fine roots; common fine and medium pores; moderately acid; clear smooth boundary.

Bt1—26 to 49 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, firm; common fine roots; few fine pores; common thick continuous clay films on faces of prisms; slightly acid; gradual smooth boundary.

Bt2—49 to 62 inches; yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; common fine faint reddish brown (5YR 5/4) mottles; moderate medium prismatic structure parting to weak fine and medium subangular blocky; hard, friable; common thick continuous clay films on faces of prisms; few fine roots; few vertical streaks of uncoated sand grains; slightly acid; gradual smooth boundary.

Bt3—62 to 75 inches; yellowish red (5YR 5/6) fine sandy loam, same color moist; common medium faint light brown (7.5YR 6/4) mottles; weak coarse prismatic structure parting to weak fine subangular blocky; slightly hard, very friable; few fine roots; few thin discontinuous clay films on faces of prisms; few vertical streaks of uncoated sand grains; slightly acid.

The thickness of the solum ranges to more than 60 inches. The combined thickness of the A and E

horizons ranges from 20 to 40 inches. Content of clay in the control section ranges from 20 to 35 percent.

The A horizon is brown, pale brown, yellowish brown, or light yellowish brown. It has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 3 or 4. Reaction ranges from moderately acid to neutral.

The E horizon is light yellowish brown, very pale brown, light brown, or pink. It has hue of 7.5YR or 10YR, value of 6 or 7, and chroma of 4. Reaction ranges from moderately acid to neutral.

The Bt1 horizon is red, yellowish red, or reddish yellow. It has hue of 2.5YR or 5YR, value of 4 to 6, and chroma of 6 or 8. The texture is sandy clay loam or clay loam. Reaction is moderately acid or slightly acid.

The Bt2 and Bt3 horizons are yellowish red or reddish yellow. They have hue of 5YR, value of 4 to 6, and chroma of 6 or 8. The texture is fine sandy loam, loam, or sandy clay loam. Reaction is moderately acid or slightly acid.

Edge Series

The Edge series consists of deep, well drained, strongly sloping, loamy soils on uplands. These soils formed in stratified loamy and clayey materials. Slopes range from 5 to 12 percent.

Typical pedon of Edge gravelly fine sandy loam, 5 to 12 percent slopes, eroded; in La Grange, from the intersection of U.S. Highway 77 and Texas Highway 71, 14.8 miles west on Texas Highway 71, 0.7 mile west on county road, 1.0 mile south, about 0.1 mile east, about 0.1 mile southeast, and 160 feet west of county road in rangeland that was previously cultivated.

Ap—0 to 5 inches; yellowish brown (10YR 5/4) gravelly fine sandy loam, dark brown (10YR 4/4) moist; weak fine subangular blocky structure; hard, friable; common fine and medium roots; few fine pores; few wormcasts and channels; 15 percent rounded siliceous pebbles; few small cobbles; slightly acid; clear wavy boundary.

Bt1—5 to 19 inches; reddish brown (5YR 5/4) clay, reddish brown (5YR 4/4) moist; moderate medium prismatic structure parting to moderate medium angular blocky; extremely hard, very firm; few fine roots; common thin clay films on faces of peds; common pressure faces; moderately acid; gradual wavy boundary.

Bt2—19 to 30 inches; reddish brown (5YR 5/4) clay, reddish brown (5YR 4/4) moist; common medium distinct brown (10YR 5/3) and yellowish brown (10YR 5/4) mottles; moderate medium prismatic structure; few fine roots; few thin clay films on faces of peds; common pressure faces; strongly acid; gradual wavy boundary.

Bt3—30 to 36 inches; yellowish red (7.5YR 6/6) clay loam, strong brown (7.5YR 5/6) moist; common medium prominent very pale brown (10YR 7/3) and common medium distinct yellowish red (5YR 5/8) mottles; moderate medium angular blocky structure; very hard, firm; few fine roots; few fine pores; few thin clay films on faces of peds; slightly acid; gradual wavy boundary.

BCt—36 to 46 inches; light yellowish brown (10YR 6/4) clay loam, yellowish brown (10YR 5/4) moist; common medium distinct yellowish brown (10YR 5/6) and light brown (7.5YR 6/4) mottles; weak fine angular blocky structure; very hard, firm; few fine roots; common thick clay films on faces of peds; common fragments of shaly material; slightly acid; diffuse smooth boundary.

C—46 to 64 inches; stratified light yellowish brown (2.5Y 6/4) fine sandy loam, light olive brown (2.5Y 5/4) moist and brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; common medium distinct strong brown (7.5YR 5/6) mottles; massive; very hard, firm; few fine roots; neutral.

The thickness of the solum ranges from 40 to 60 inches. The content of clay in the control section ranges from 35 to 50 percent.

The A horizon is yellowish brown, light yellowish brown, brown, or light brownish gray. It has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 4. It contains 15 to 35 percent siliceous and ironstone pebbles and a few siliceous cobbles. Reaction ranges from strongly acid to slightly acid.

The Bt1 horizon is reddish brown or yellowish red. Mottles in shades of brown, yellow, and gray range from few to common. The Bt1 horizon has hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 6 or 8. The texture is sandy clay or clay. Siliceous pebbles and ironstone fragments range from 0 to 5 percent. Reaction ranges from very strongly acid to moderately acid.

The Bt2 and Bt3 horizons are reddish brown, yellowish red, or strong brown. The Bt3 horizon has few to many yellowish, reddish, brownish, or grayish mottles. The Bt2 and Bt3 horizons have hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 4 to 8. The texture is clay loam, sandy clay, or clay. Siliceous pebbles and fragments of ironstone range from 0 to 5 percent. Reaction ranges from very strongly acid to slightly acid.

The BCt horizon is in shades of brown. It has hue of 10YR, value of 5 or 6, and chroma of 4 or 6 and has yellowish, reddish, or grayish mottles. Thin fragments or strata of sandstone, ironstone, or shale make up less than 15 percent. The texture is sandy clay loam, clay loam, or fine sandy loam or the horizon is

stratified with these and other clayey or sandy materials. Reaction ranges from very strongly acid to slightly alkaline.

The C horizon is mainly in shades of gray or brown, and contains yellowish and reddish mottles and strata. It is stratified with loamy and siltstone materials. Thin sandy strata are common. Reaction ranges from moderately acid to moderately alkaline.

Elmendorf Series

The Elmendorf series consists of very deep, well drained, loamy soils on uplands. They formed in calcareous clayey marine shales. Slopes range from 1 to 3 percent.

Typical pedon of Elmendorf loam in an area of Elmendorf-Denhawken complex, 1 to 3 percent slopes; in Cistern, from the intersection of Farm Road 2237 and Texas Highway 95, 2.4 miles north on Texas Highway 95, and 170 feet west in rangeland.

A—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; very hard, firm; common fine and medium roots; few fine pores; neutral; clear wavy boundary.

Bt1—5 to 13 inches; very dark gray (10YR 3/1) clay loam, black (10YR 2/1) moist; moderate fine and medium subangular blocky structure; very hard, firm; common fine roots; common thin clay films on faces of peds; few fine pores; neutral; gradual wavy boundary.

Bt2—13 to 27 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; moderate medium angular blocky structure; extremely hard, very firm; common fine roots; common thin clay films on faces of peds; few ironstone pebbles; slightly alkaline; gradual wavy boundary.

Bt3—27 to 40 inches; yellowish brown (10YR 5/4) clay, brown (10YR 4/3) moist; common medium distinct light olive brown (2.5Y 5/6) and few fine distinct yellowish, brown (10YR 5/6) mottles; moderate fine and medium angular blocky structure; extremely hard, very firm; few fine roots; common pitted concretions of calcium carbonate; common ironstone pebbles; common black concretions; common vertical cracks filled with material from above; slightly alkaline; gradual wavy boundary.

Bky—40 to 54 inches; pale yellow (2.5Y 7/4) clay, light olive brown (2.5Y 5/4) moist; common medium distinct brownish yellow (10YR 6/6) mottles; weak fine and medium angular blocky structure; very hard, very firm; few fine roots; common soft concretions of calcium carbonate; 5 to 10 percent gypsum crystals; strongly effervescent; slightly alkaline; gradual wavy boundary.

By1—54 to 66 inches; pale yellow (5Y 7/4) clay, light olive gray (5Y 6/2) moist; many coarse prominent yellowish brown (10YR 5/6) mottles; weak medium angular blocky structure; extremely hard, very firm; few pitted concretions of calcium carbonate; 15 percent gypsum crystals; common fragments of shale; strongly effervescent; slightly alkaline; gradual wavy boundary.

By2—66 to 80 inches; pale yellow (5Y 7/4) clay, same color moist; many coarse prominent strong brown (7.5YR 5/8) mottles; extremely hard, very firm; 25 percent shale fragments; 20 percent gypsum crystals; violently effervescent; slightly alkaline.

The thickness of the solum ranges from 60 to more than 80 inches. When dry, the soil has cracks as much as 2 inches wide that extend to a depth of more than 50 inches. Depth to secondary carbonates exceeds 35 inches.

The A horizon is very dark gray, very dark grayish brown, or dark grayish brown. It has hue of 10YR, value of 3 or 4, and chroma of 1 or 2. Reaction is neutral or slightly alkaline.

In more than half the horizontal distance of the pedon, the Bt horizon is dark gray (10YR 4/1), very dark grayish brown (10YR 3/2), or dark grayish brown (10YR 4/2). It has hue of 10YR, value of 3 or 4, and chroma of 1 or 2. The texture is clay or clay loam. The rest of the Bt horizon is olive brown, light olive brown, or light yellowish brown. It has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 4 to 6. Reaction is neutral to moderately alkaline. The Bt horizon is calcareous in some pedons.

The Bky and By horizons are light yellowish brown, light olive brown, light gray, or light olive gray. They have hue of 2.5Y or 5Y, value of 5 to 7, and chroma of 2 to 4. Mottles are in shades of brown or yellow. The texture is clay. Shale fragments range from 5 to 10 percent. Reaction is slightly alkaline or moderately alkaline.

Some pedons have a BCy horizon that is clay in shades of brown or gray. It has 5 to 15 percent gypsum crystals. Reaction is slightly alkaline or moderately alkaline.

Some pedons have a C horizon in shades of gray, brown, and yellow. It is shale that has clay texture interbedded with loamy material. Shale fragments range from 20 to 35 percent. Gypsum crystals range from 0 to 25 percent.

This soil is a taxadjunct to the Elmendorf series because it is moist for a longer period during most years. Differences in interpretations are minor.

Flatonia Series

The Flatonia series consists of deep, moderately well drained, loamy soils on very gently sloping uplands. These soils formed in loamy and clayey tuffaceous materials. Slopes range from 1 to 3 percent.

Typical pedon of Flatonia loam, 1 to 3 percent slopes; in La Grange, from the intersection of U.S. Highway 77 and Texas Highway 71, 2.6 miles north on U.S. Highway 77, 5.9 miles northeast on Farm Road 2145, and 190 feet northwest in an abandoned field.

Ap—0 to 4 inches; dark gray (10YR 4/1) loam; very dark gray (10YR 3/1) moist; moderate fine subangular blocky structure; very hard, firm; common fine and few medium and coarse roots; few subrounded siliceous pebbles less than 1 inch in diameter; slightly acid; abrupt wavy boundary.

Bt1—4 to 14 inches; very dark gray (10YR 3/1) clay; black (10YR 2/1) moist; weak medium prismatic structure parting to moderate fine and medium angular blocky; extremely hard, very firm; few fine, medium, and coarse roots; few siliceous pebbles; few fine krotovinas; few pressure faces; slightly acid; gradual wavy boundary.

Bt2—14 to 33 inches; dark gray (10YR 4/1) clay; very dark gray (10YR 3/1) moist; weak medium prismatic structure parting to moderate fine and medium angular blocky; extremely hard, very firm; few fine, medium, and coarse roots; few slickensides; common pressure faces; few weakly cemented fine calcium carbonate concretions and calcareous mudstone fragments; neutral; gradual wavy boundary.

Bt3—33 to 43 inches; light brownish gray (10YR 6/2) silty clay; grayish brown (10YR 5/2) moist; few medium distinct dark gray (10YR 4/1) and light brownish gray mottles; moderate fine and very fine subangular blocky structure; very hard, firm; few fine and medium roots; few fine weakly cemented calcium carbonate concretions; slightly effervescent; slightly alkaline; gradual wavy boundary.

BCk—43 to 55 inches; light gray (5Y 7/2) clay loam; light brownish gray (10YR 6/2) moist; common fine distinct olive yellow (5Y 6/6) mottles; weak fine subangular blocky structure; 15 to 20 percent weakly cemented masses of white (10YR 8/1) tuffaceous siltstone; few fine roots; strongly effervescent; slightly alkaline; gradual wavy boundary.

Cr—55 to 80 inches; white (5Y 8/1) weakly cemented tuffaceous siltstone; light gray (5Y 7/2) moist; massive; strongly effervescent; slightly alkaline.

The thickness of the solum ranges from 40 to 60 inches. Cracks 1 to 2 inches wide extend from the surface to the Cr horizon and are at least 0.25 inch wide at a depth of 20 inches. Concretions of calcium carbonate are below a depth of 24 inches in most pedons, but concretions of calcium carbonate extend to the surface in some small microknolls. The content of clay in the control section averages 40 to 50 percent.

The A horizon is very dark grayish brown, dark grayish brown, dark gray, or very dark gray. It has hue of 10YR, value of 2 to 4, and chroma of 1 or 2. Reaction ranges from slightly acid to slightly alkaline and some microknolls are calcareous and moderately alkaline.

The Bt horizon is gray, dark gray, very dark gray, light brownish gray, grayish brown, dark grayish brown, or very dark grayish brown. It has hue of 10YR or 2.5Y, value of 3 to 6, and chroma of 1 or 2. The texture is clay, sandy clay, and silty clay. COLE ranges from 0.07 to 0.1. Reaction ranges from slightly acid to moderately alkaline. Some pedons have a Btk horizon that has colors, texture, and reaction similar to the Bt horizon. Some pedons in the Btk horizon have mottles in shades of brown, yellow, and gray.

The BCk horizon is gray, light gray, light brownish gray, grayish brown, light olive gray, or olive gray. It has hue of 10YR, 2.5Y or 5Y, value of 5 to 7, and chroma of 1 or 2. Some pedons have a few brownish or grayish mottles. The texture is clay loam, loam, sandy clay loam, sandy clay, or clay. Concretions, threads, or soft masses of calcium carbonate range from few to many. Reaction is slightly or moderately alkaline.

The Cr horizon is white, light gray, very pale brown, pale yellow, or light olive gray. It has hue of 10YR, 2.5Y, or 5Y, value of 7 or 8, and chroma of 1 to 3. It is weakly cemented bedrock that has silt loam texture.

Frelsburg Series

The Frelsburg series consists of very deep, moderately well drained, clayey soils on uplands. These soils formed in calcareous clays and marls. Slopes range from 1 to 8 percent.

Typical pedon of Frelsburg clay, 1 to 3 percent slopes; in La Grange, from the intersection of Texas Highway 71 and Texas Highway 159, 12.1 miles northeast on Texas Highway 159, and 510 feet north in improved pasture.

Ap—0 to 6 inches; very dark gray (10YR 3/1) clay, very dark gray (10YR 3/1) moist; weak coarse subangular blocky structure; very hard, very firm; many very fine and fine roots; slightly effervescent; slightly alkaline; clear smooth boundary.

A—6 to 10 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure; very hard, very firm; common very fine and fine roots; few fine concretions of calcium carbonate; strongly effervescent; slightly alkaline; clear wavy boundary.

Bkss1—10 to 17 inches; gray (10YR 5/1) clay, gray (10YR 5/1) moist; weak medium angular blocky structure; very hard, very firm; few very fine roots; common shiny ped faces; few grooved intersecting slickensides; common pockets of material from above embedded in matrix of peds; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bkss2—17 to 39 inches; gray (10YR 6/1) clay, gray (10YR 6/1) moist; light olive brown mottles; weak medium angular blocky structure; very hard, very firm; few very fine roots; common fine concretions of calcium carbonate; common grooved intersecting slickensides; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bkss3—39 to 70 inches; gray (10YR 6/1) clay, gray (10YR 6/1) moist; many fine and medium distinct light yellowish brown (2.5Y 6/4) mottles; weak medium angular blocky structure; very hard, very firm; few very fine roots; many fine and very fine concretions of calcium carbonate; many grooved intersecting slickensides; common dark gray (10YR 4/1) material in matrix of peds; strongly effervescent; moderately alkaline; gradual smooth boundary.

BCk—70 to 80 inches; mottled light gray (2.5Y 7/2), light reddish brown (5YR 6/4) clay; weak coarse angular blocky structure; very hard, very firm; common concretions of calcium carbonate; few fine black and brown concretions; violently effervescent; moderately alkaline.

The thickness of the solum ranges from 50 to more than 80 inches. The soil is calcareous and slightly alkaline or moderately alkaline clay or silty clay throughout. Content of clay ranges from 45 to 60 percent. Cracks 1 to 2 inches wide extend to a depth of more than 20 inches when the soil is dry. Intersecting slickensides and pressure faces begin at a depth of 10 to 20 inches. Cycles of microdepressions and microknolls are repeated at 5- to 15-foot intervals.

The A horizon is dark gray, very dark gray, or black. It has hue of 10YR, 2.5Y, or 5Y, value of 2 or 3, and chroma of 1 or 2. Thickness ranges from 10 to 24 inches in microdepressions and as much as 6 inches on microknolls, averaging less than 12 inches in more than 60 percent of the pedon.

The Bkss horizon is grayish brown, light gray, gray, grayish brown, light olive gray, or light brownish gray. It has hue of 10YR, 2.5Y, or 5Y, value of 5 to 7, and chroma of 1 or 2. Concretions and soft masses of calcium carbonate range from few to many. Black concretions and mottles in shades of brown or yellow range from few to none.

The BCk horizon is in shades of white, brown, gray, or yellow. Soft masses and concretions of calcium carbonate range from few to many. Black concretions, noncalcareous white concretions, and salt crystals range from none to few. Some pedons have a C horizon that has color, texture, and reaction similar to the BCk horizon.

Gad Series

The Gad series consists of very deep, somewhat excessively drained, sandy soils on flood plains. These soils formed in recent sandy alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Gad loamy fine sand, occasionally flooded; in La Grange, from the intersection of U.S. Highway 77 and Texas Highway 71, 1.6 miles south on U.S. Highway 77, 7.9 miles southeast on Farm Road 155, 1.4 miles northeast on county road, and 100 feet southeast of road in a stand of pecan trees.

A—0 to 11 inches; brown (10YR 5/3) loamy fine sand, dark brown (10YR 4/3) moist; weak fine granular structure; slightly hard, very friable; common fine and medium roots; strongly effervescent; moderately alkaline; clear smooth boundary.

C1—11 to 40 inches; light yellowish brown (10YR 6/4) loamy fine sand, yellowish brown (10YR 5/4) moist; weak fine granular structure and single grain; soft, loose, very friable; common thin strata of light brown (7.5YR 6/4) fine sand and few thin strata of brown (10YR 5/3) fine sandy loam; few fine roots; violently effervescent; moderately alkaline; clear smooth boundary.

C2—40 to 80 inches; alternating thin strata of light yellowish brown (10YR 6/4) loamy fine sand, yellowish brown (10YR 5/4) moist; light brown (7.5YR 6/4) fine sand, brown (7.5YR 5/4) moist; and brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; massive and single grain; loose, very friable; few fine roots; violently effervescent; moderately alkaline.

The A horizon is brown, yellowish brown, or dark brown. It has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. The texture is loamy fine sand or fine sand.

The C horizons are brown, dark brown, light brown, light yellowish brown, pale brown, very pale brown, or pink. They have hue of 7.5YR or 10YR, value of 6 to 8, and chroma of 3 or 4. The texture is loamy fine sand or fine sand with common to many strata less than 1 inch thick. The texture of the strata is fine sandy loam, very fine sandy loam, silt loam, or silty clay loam that is brown and dark brown in color.

Ganado Series

The Ganado series consists of very deep, moderately well drained, clayey soils on flood plains. These soils formed in alkaline clayey alluvium. Slopes are 0 to 1 percent.

Typical pedon of Ganado clay, occasionally flooded; in Schulenburg, from the intersection of U.S. Highway 90 and U.S. Highway 77, 0.6 mile west on U.S. Highway 90, 2.8 miles southwest on Farm Road 957, 0.3 mile east on ranch road to ranch headquarters, and 0.5 mile northeast on the West Navidad River flood plain.

A—0 to 12 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate fine and medium subangular blocky structure; very hard, very firm; common fine and medium roots; few fine pores; few worm channels and casts; slightly alkaline; clear wavy boundary.

Bss1—12 to 25 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate fine and medium subangular blocky structure; extremely hard, very firm; common fine and medium roots; few fine pores; few worm channels and casts; common grooved intersecting slickensides; slightly alkaline; gradual wavy boundary.

Bss2—25 to 49 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; few medium faint dark grayish brown (10YR 4/2) mottles; moderate fine and medium angular blocky structure; extremely hard, very firm; common fine and medium roots; common grooved intersecting slickensides; few fine concretions of calcium carbonate; strongly effervescent; slightly alkaline; gradual boundary.

Bkss—49 to 67 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate medium angular blocky structure; extremely hard, very firm; few fine roots; common grooved intersecting slickensides; common fine and medium concretions of calcium carbonate; few fine black concretions; strongly effervescent; moderately alkaline; clear wavy boundary.

C—67 to 80 inches; light gray (2.5Y 7/2) sandy clay, light brownish gray (2.5Y 6/2) moist; few fine distinct dark yellowish brown (10YR 4/6) mottles; weak angular blocky structure; hard, firm; few soft masses of calcium carbonate; few fine black concretions; slightly effervescent; moderately alkaline.

The thickness of the solum ranges to more than 60 inches. In native areas, gilgai microrelief consists of microhighs 6 to 12 inches higher than the microlow. The distance between center of high and center of low is 5 to 20 feet. When dry, cracks 1 to 3 inches wide extend to a depth of 40 inches or more. Intersecting slickensides begin at a depth of 10 to 30 inches. The 10- to 40-inch control section contains 40 to 60 percent clay. Most pedons are calcareous below a depth of 25 inches and many are calcareous throughout.

The A horizon is black or very dark gray. It has hue of 10YR, value of 2 or 3, and chroma of 1. Reaction is neutral or slightly alkaline.

The B horizon is very dark grayish brown, dark gray, or very dark gray. It has hue of 10YR, value of 3 or 4, and chroma of 1 or 2. Some pedons have mottles in shades of brown, red, or yellow. The texture is clay. Calcium carbonate concretions range from none to many. Reaction is slightly alkaline or moderately alkaline.

The C horizon is in shades of gray. It has hue of 10YR or 2.5Y, value of 4 to 7, and chroma of 2. Some pedons have mottles in shades of brown, red, or yellow. The texture is sandy clay loam, clay loam, silty clay loam, or sandy clay. Reaction is moderately alkaline. Some pedons have a 2C horizon that has color, texture, and reaction similar to those of the C horizon.

Gholson Series

The Gholson series consists of very deep, well drained, loamy soils formed in alluvial materials. These nearly level to very gently sloping terrace soils have slopes ranging from 0 to 3 percent.

Typical pedon of Gholson very fine sandy loam, 1 to 3 percent slopes; in La Grange, from the intersection of U.S. Highway 77 and Texas Highway 71, 8.9 miles west on Texas Highway 71, 0.3 mile west on old Highway 71 (West Loop 543), 0.7 mile northwest on county road, 0.6 mile north on county road across railroad, and 100 feet east in pasture.

Ap—0 to 7 inches; brown (10YR 5/3) very fine sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; loose, friable; many fine, medium, and coarse roots; moderately acid; clear smooth boundary.

A—7 to 13 inches; brown (10YR 4/3) very fine sandy loam, dark brown (10YR 3/3) moist; weak fine

subangular blocky structure; slightly hard, friable; many fine, medium, and coarse roots; slightly acid; clear wavy boundary.

Bt1—13 to 25 inches; reddish brown (5YR 4/4) clay loam, dark reddish brown (5YR 3/4) moist; moderate fine and medium subangular blocky structure; hard, friable; many fine and medium roots; few dark reddish brown (5YR 3/3) clay films on faces of peds; neutral; gradual smooth boundary.

Bt2—25 to 38 inches; yellowish red (5YR 4/6) clay loam, yellowish red (5YR 4/6) moist; moderate medium subangular blocky structure; hard, friable; common fine roots; common dark reddish brown (5YR 3/3) clay films on faces of peds; common fine masses of barite; neutral; clear smooth boundary.

Bt3—38 to 56 inches; yellowish red (5YR 5/6) loam, yellowish red (5YR 4/6) moist; moderate fine subangular blocky structure; slightly hard, firm; common fine roots; common reddish brown (5YR 4/4) clay films on faces of peds; neutral; clear smooth boundary.

BCk1—56 to 74 inches; reddish yellow (7.5YR 6/6) loam, strong brown (7.5YR 5/6) moist; weak fine subangular blocky structure; slightly hard, friable; few fine roots; common pockets and soft masses of calcium carbonate; strongly effervescent; slightly alkaline; gradual smooth boundary.

BCk2—74 to 80 inches; reddish yellow (7.5YR 6/6) fine sandy loam, strong brown (7.5YR 5/6) moist; weak fine subangular blocky structure; slightly hard, friable; common soft masses of calcium carbonate; strongly effervescent; slightly alkaline.

The thickness of the solum ranges from 60 to 80 or more inches. Small siliceous pebbles range from none to about 10 percent. Content of clay in the control section ranges from 20 to 30 percent. Clay films range from few to common throughout the argillic horizon.

The A horizon is dark brown, brown, pale brown, or light brown. It has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 to 4. Some pedons have an E horizon. The E horizon is 1 to 2 units of value higher than the A horizon. Reaction ranges from moderately acid to neutral. Thickness ranges from 10 to 20 inches.

The Bt horizon is reddish brown, yellowish red, or red. It has hue of 2.5YR or 5YR, value of 4 to 6, and chroma of 4 to 8. The texture is loam, sandy clay loam, or clay loam. Reaction is slightly acid or neutral.

Some pedons have a BCt horizon that is reddish yellow, light brown, strong brown, or yellowish red. It has hue of 5YR or 7.5YR, value of 4 to 6, and chroma of 4 to 8. The texture is loamy fine sand, loam, or fine sandy loam. Reaction is neutral or slightly alkaline. The matrix is calcareous. Few visible carbonates in the form of films or streaks are in some pedons.

The BCk horizon is reddish yellow, light brown, strong brown, or yellowish red. It has hue of 5YR or 7.5YR, value of 4 or 6, and chroma of 4 to 8. The texture is loamy fine sand, loam, or fine sandy loam. Reaction ranges from neutral to moderately alkaline. Films, threads, masses, and concretions of calcium carbonate range from few to common in some pedons. Some pedons have a BC horizon that has colors, textures, and reaction similar to those of the BCk horizon.

Some pedons have a C horizon that is yellowish red, light brown, strong brown, or reddish yellow. It has hue of 5YR, value of 4 to 6, and chroma of 4 to 8. The texture is sandy clay loam, very fine sandy loam, fine sandy loam, loamy fine sand, or loamy very fine sand. Some pedons contain thin strata of fine gravel below a depth of 70 inches. Reaction is slightly or moderately alkaline.

Gredge Series

The Gredge series consists of very deep, moderately well drained, loamy soils on erosional Pleistocene terraces. The soil formed in loamy and clayey sediments. Slopes range from 1 to 3 percent.

Typical pedon of Gredge fine sandy loam, 1 to 3 percent slopes; in Muldoon, from the intersection of Farm Road 154 and Farm Road 2237, 3.1 miles west on Farm Road 2237, 0.5 mile north on ranch oil field road, and 230 feet east in rangeland.

A—0 to 6 inches; pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; hard, firm; many fine and medium roots; few fine pores; few wormcasts and channels; moderately acid; abrupt wavy boundary.

Bt1—6 to 16 inches; dark red (2.5YR 3/6) sandy clay, dark red (2.5YR 3/6) moist; common fine and medium prominent grayish brown (10YR 5/2) and common medium distinct yellowish red (5YR 4/6) mottles; moderate coarse prismatic structure parting to moderate angular blocky; extremely hard, very firm; common fine and medium roots; common thin clay films on faces of peds; thin coat of loamy material on faces of prisms, loamy material in filled cracks; strongly acid; clear wavy boundary.

Bt2—16 to 24 inches; reddish brown (5YR 5/4) sandy clay, reddish brown (5YR 4/4) moist; common medium prominent light brownish gray (10YR 6/2), pale brown (10YR 6/3), and light yellowish brown (10YR 6/4) mottles; moderate coarse prismatic

structure parting to moderate medium angular blocky; extremely hard, very firm; common fine roots; common thin clay films on faces of peds; thin coat of loamy material on faces of prisms, loamy material in filled cracks; common pressure faces; strongly acid; gradual wavy boundary.

Bt3—24 to 34 inches; mottled light yellowish brown (10YR 6/4) and light brownish gray (10YR 6/2) sandy clay loam, dark yellowish brown (10YR 4/4) and light brownish gray (10YR 6/2) moist; few medium distinct strong brown (7.5YR 5/6) mottles in ped interiors; moderate coarse angular blocky structure; very hard, very firm; common fine roots; few fine pores; many thick dark brown (7.5YR 4/4) clay coatings on faces of peds; loamy material in filled cracks; few scattered pockets of fine concretions of calcium carbonate in lower part; few fine fragments of weathered iron enriched sandstone; neutral; gradual wavy boundary.

BCt—34 to 51 inches; reddish yellow (7.5YR 6/6) sandy clay loam, strong brown (7.5YR 5/6) moist; few fine and medium prominent light gray (10YR 7/2) mottles; weak medium subangular blocky structure; hard, friable; few fine roots; common fine and medium pores; few thin clay films in upper part; few black masses and fine concretions; slightly alkaline; gradual wavy boundary.

BC—51 to 80 inches; brownish yellow (10YR 6/6) fine sandy loam, yellowish brown (10YR 5/6) moist; common medium faint brownish yellow (10YR 6/8) mottles; weak medium subangular blocky structure; slightly hard, friable; few fine roots; few 0.25 to 1.0 inch thick strata of brittle sandy material; few fine and medium pockets of iron enriched platy material; slightly alkaline.

The thickness of the solum ranges to more than 60 inches. The content of clay in the control section ranges from 35 to 55 percent.

The A horizon is brown, pale brown, grayish brown, or light brownish gray. Some pedons have a thin E horizon above the Bt horizon. The A horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 2 to 4. Reaction ranges from strongly acid to slightly acid. Thickness of the A horizon ranges from 3 to 13 inches, averaging about 6 inches.

The Bt1 horizon is dark red or red. It has hue of 2.5YR, value of 3 or 4, and chroma of 6 or 8. Mottles are in shades of red or brown. The texture is clay or sandy clay. Reaction ranges from very strongly acid to moderately acid.

The Bt2 horizon is red, reddish brown, yellowish red, or grayish brown. It has hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 3 to 8. Mottles are in shades of red, brown, yellow, and gray. The texture is clay, sandy clay, or sandy clay loam. Reaction ranges from very strongly acid to slightly acid.

The Bt3 horizon is mottled in shades of brown, red, gray, and yellow. It has hue of 5YR to 10YR, value of 4 to 6, and chroma of 1 to 8. The texture is clay loam or sandy clay loam. Reaction ranges from strongly acid to slightly alkaline.

The BCt horizon is reddish yellow, yellowish red, and strong brown. It has hue of 7.5YR or 5YR, value of 5 or 6, and chroma of 6 or 8. Brownish or grayish mottles range from none to common. The texture is sandy clay loam. Reaction ranges from neutral to moderately alkaline.

The BC horizon is stratified and mottled in shades of yellow, brown, red, and gray. The texture is fine sandy loam or sandy clay loam. Reaction ranges from neutral to moderately alkaline. Some pedons have a C horizon that is stratified weakly consolidated shale. Reaction ranges from neutral to moderately alkaline.

Greenvine Series

The Greenvine series consists of moderately deep, moderately well drained, clayey soils on uplands. These soils formed in residuum from tuffaceous clays and sandstones. Slopes range from 1 to 8 percent.

Typical pedon of Greenvine clay, 1 to 3 percent slopes; in La Grange, from the intersection of Texas Highway 71 and Farm Road 609, 17.6 miles southwest on Farm Road 609, 0.25 mile east on county road, and 100 feet south of road in rangeland.

A—0 to 14 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate medium angular blocky structure; extremely hard, very firm; many fine and medium roots; few wormcasts and channels; strongly effervescent; slightly alkaline; gradual wavy boundary.

Bss—14 to 29 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate coarse angular blocky structure parting to moderate medium angular blocky; extremely hard, very firm; common fine roots; few wormcasts and channels; common grooved intersecting slickensides; strongly effervescent; slightly alkaline; gradual wavy boundary.

Bkss—29 to 39 inches; gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; moderate coarse angular blocky structure parting to moderate medium angular blocky; extremely hard, very firm; few fine roots; common fine and medium concretions of calcium carbonate; few fine black concretions; common grooved intersecting slickensides; violently effervescent; slightly alkaline; diffuse wavy boundary.

Cr—39 to 60 inches; white (10YR 8/1) tuff, light gray (10YR 7/2) moist; few fine distinct light olive brown (2.5Y 5/4) mottles; massive; hard, friable; few fine roots along fine cracks and cleavage planes; few thin chalk strata; common soft masses of calcium carbonate; violently effervescent; moderately alkaline.

The thickness of the solum ranges from 24 to 40 inches. Intersecting slickensides and pressure faces begin at a depth of 10 to 15 inches. Cycles of microdepressions and microknolls are repeated at 10- to 15-foot intervals. When dry, these soils have cracks from 1 to 2 inches wide that can extend in depth to the paralithic contact.

The A horizon is very dark gray or black. It has hue of 10YR, value of 2 or 3, and chroma of 1. Reaction is neutral to moderately alkaline. The thickness is more than 12 inches in more than 50 percent of the pedon.

The Bss and Bkss horizons are dark gray, light gray, or gray. They have hue of 10YR, value of 4 to 6, and chroma of 1. The texture is clay or silty clay. Reaction is slightly or moderately alkaline.

The Cr horizon is in shades of white, gray, brown, yellow, or olive. It is weakly cemented tuffaceous material with texture of silty clay loam, silty clay, clay, sandy clay, or clay loam. Calcium carbonate as coatings, nodules, and soft masses range from few to many.

Hallettsville Series

The Hallettsville series consists of very deep, moderately well drained, loamy soils on uplands. These soils formed in alkaline clayey marine sediments. Slopes range from 1 to 3 percent.

Typical pedon of Hallettsville fine sandy loam, 1 to 3 percent slopes; in La Grange, from the intersection of U.S. Highway 77 and State Highway 71, 11.3 miles south on U.S. Highway 77, 3.6 miles west on Farm Road 956, 0.7 mile south on Farm Road 2238, and 75 feet east of fence in pasture.

A—0 to 8 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; hard, friable; common fine, medium, and coarse roots; few fine pores; moderately acid; clear wavy boundary.

Bt1—8 to 20 inches; very dark gray (10YR 3/1) sandy clay, black (10YR 2/1) moist; moderate medium prismatic structure parting to weak medium subangular blocky; very hard, firm; common fine and medium roots; few fine pores; few thick clay films on faces of peds; slightly acid; gradual wavy boundary.

Bt2—20 to 35 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; few fine distinct dark yellowish brown (10YR 4/6) mottles; moderate medium subangular blocky structure; extremely hard, very firm; few fine and medium roots; few fine pores; few thin clay films on faces of peds; few slickensides and pressure faces; few fine black concretions; slightly alkaline; gradual wavy boundary.

Btk1—35 to 41 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; extremely hard, very firm; few fine roots; few fine pores; common shiny pressure faces; common fine and medium concretions of calcium carbonate; strongly effervescent; slightly alkaline; gradual wavy boundary.

Btk2—41 to 53 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; moderate fine and medium subangular blocky structure; hard, firm; few fine roots; few fine pores; common concretions, threads and soft masses of calcium carbonate; few fine black concretions and dark streaks of soil material; strongly effervescent; slightly alkaline; gradual wavy boundary.

BC—53 to 62 inches; light yellowish brown (10YR 6/4) sandy clay loam, yellowish brown (10YR 5/4) moist; weak fine and medium subangular blocky structure; hard, friable; few fine roots; common fine and medium pores; few threads and soft masses of calcium carbonate; few fine black concretions; strongly effervescent; moderately alkaline; diffuse wavy boundary.

2C—62 to 80 inches; pale brown (10YR 6/3) and light gray (2.5Y 7/2) clay loam, brown (10YR 5/3) and light brownish gray (2.5Y 6/2) moist; massive; stratified with lenses and thin strata of shale; hard, friable; few fine roots; few fine pores; few fine black concretions; few soft masses of calcium carbonate; strongly effervescent; moderately alkaline.

The thickness of the solum ranges from 50 to about 80 inches. The mollic epipedon includes the upper part of the argillic horizon. Mottles are in shades of yellow, red, or brown and range from few to common throughout the Bt horizon. Depth to secondary carbonates ranges from 28 to 50 inches.

The A horizon is very dark gray, dark gray, very dark grayish brown, dark grayish brown, or grayish brown. It has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 1 or 2. Reaction ranges from moderately acid to neutral.

The Bt horizon is very dark gray or dark gray in the upper part and has hue of 10YR, value of 3 or 4, and

chroma of 1. In the lower part, the Bt horizon is gray, light gray, grayish brown, or light brownish gray. It has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2. The texture is clay, clay loam, or sandy clay. The average content of clay in the control section ranges from 35 to 45 percent. Reaction ranges from slightly acid to slightly alkaline.

The Btk horizon is light yellowish brown, light brownish gray, grayish brown, pale brown, or dark grayish brown. It has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4, with none to common mottles in shades of red, brown, or gray. The texture is sandy clay, clay loam, or sandy clay loam. Concretions, threads, or soft masses of calcium carbonate range from few to common. Reaction is slightly alkaline or moderately alkaline.

The BC and 2C horizons are in shades of brown, gray, or white. The texture is clay loam, sandy clay loam, or fine sandy loam. Reaction is slightly alkaline or moderately alkaline.

Inez Series

The Inez series consists of very deep, moderately well drained, nearly level, loamy soils on uplands. These soils formed in clayey and loamy sediments. Slopes are 0 to 1 percent.

Typical pedon of Inez fine sandy loam, 0 to 1 percent slopes; in Cistern, from the intersection of Texas Highway 95 and Farm Road 2237, 1.3 miles east on Farm Road 2237, and 100 feet north of road in pasture.

A—0 to 7 inches; light brownish gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) moist; weak fine granular structure; slightly hard, friable; many fine and medium roots; moderately acid; clear wavy boundary.

E—7 to 17 inches; very pale brown (10YR 7/3) fine sandy loam, pale brown (10YR 6/3) moist; few fine distinct yellowish brown mottles; moderate medium subangular blocky structure parting to weak fine granular; slightly hard, friable; many fine and medium roots; moderately acid; abrupt wavy boundary.

Bt1—17 to 27 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; common medium prominent yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; extremely hard, very firm; common fine and medium roots; few thin clay films on faces of peds; few fine black stains; moderately acid; gradual wavy boundary.

Bt2—27 to 38 inches; light brownish gray (10YR 6/2) clay, grayish brown (10YR 5/2) moist; common medium distinct yellowish brown (10YR 5/4) and few medium distinct very dark gray (10YR 3/1) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; extremely hard, very firm; common fine and medium roots; few thin clay films on faces of peds; few fine black stains; few white salt masses; few streaks of darker material; slightly acid; gradual wavy boundary.

Bt3—38 to 49 inches; mottled grayish brown (10YR 5/2), light brownish gray (10YR 6/2) and yellowish brown (10YR 5/4 and 5/6) sandy clay; weak medium prismatic structure parting to moderate fine and medium subangular blocky; very hard, very firm; common fine roots; few thin clay films on faces of peds; few black concretions; few white salt masses; neutral; gradual wavy boundary.

Btc1—49 to 60 inches; light brownish gray (2.5Y 6/2) sandy clay, grayish brown (2.5Y 5/2) moist; few fine prominent reddish yellow (5YR 6/6) mottles; weak fine and medium subangular blocky structure; very hard, firm; few fine roots; few thin clay films on faces of peds; common fine black concretions; common fine and medium concretions of calcium carbonate; few streaks of grayish brown (2.5Y 5/2) material; slightly alkaline; clear wavy boundary.

Btc2—60 to 80 inches; light gray (2.5Y 7/2) sandy clay loam, light brownish gray (2.5Y 6/2) moist; common fine prominent strong brown (7.5YR 5/6) and reddish yellow (5YR 5/6) mottles; weak fine subangular blocky structure; hard, firm; few fine roots; few thin clay films on faces of peds; common fine black concretions; few streaks of gray (10YR 5/1) material; slightly alkaline.

The thickness of the solum ranges from 60 to more than 80 inches. The content of clay in the control section ranges from 40 to 50 percent. Many pedons have concretions of white salts and black material that range from few to common in the Bt horizons. Depth to free carbonates ranges from 38 to 80 inches.

The A horizon is grayish brown, light brownish gray, or pale brown. It has hue of 10YR, value of 5 or 6, and chroma of 2 or 3. Reaction is moderately or slightly acid.

The E horizon is very pale brown. It has hue of 10YR, value of 7, and chroma of 3. Mottles in shades of brown or yellow range from few to common. The texture is fine sandy loam. Reaction ranges from moderately acid to neutral.

The Bt horizon is dark grayish brown, light brownish gray, or grayish brown. It has hue of 10YR, value of 4

to 6, and chroma of 2. Mottles in shades of brown, yellow, or gray range from none to many. The texture is clay or sandy clay. Reaction ranges from moderately acid to neutral.

The Btc horizon is grayish brown, light brownish gray, or light gray. It has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 1 or 2. The texture is sandy clay or sandy clay loam. Reaction ranges from neutral to moderately alkaline.

This soil is a taxadjunct to the Inez series because it is dry for a longer period during most years. Differences in interpretations are minor.

Joiner Series

The Joiner series consists of very deep, somewhat excessively drained, sandy soils on uplands. These soils formed in sandy sediments. Slopes range from 2 to 5 percent.

Typical pedon of Joiner sand, 2 to 5 percent slopes; in La Grange, from the intersection of U.S. Highway 77 and Texas Highway 71, 1.45 miles south on U.S. Highway 77, 2.2 miles southeast on Farm Road 155, 1.25 miles northeast on county road, 0.5 mile northeast on private road, 0.35 mile west on private road, and 100 feet north in woodland.

A—0 to 12 inches; grayish brown (10YR 5/2) sand, dark grayish brown (10YR 4/2) moist; single grain; soft, very friable; many very fine and fine roots and few medium roots; moderately acid; clear smooth boundary.

E1—12 to 38 inches; very pale brown (10YR 7/3) sand, brown (10YR 5/3) moist; single grain; soft, very friable; few very fine, fine, and medium roots; moderately acid; gradual smooth boundary.

E2—38 to 45 inches; white (10YR 8/2) sand, very pale brown (10YR 7/4) moist; single grain; soft, very friable; few very fine, fine, and medium roots; moderately acid; gradual smooth boundary.

Bt1—45 to 50 inches; white (10YR 8/2) loamy sand, very pale brown (10YR 7/4) moist; weak fine subangular blocky structure; soft, very friable; few fine and medium roots; few clay bridges on sand grains; few brittle masses; moderately acid; clear wavy boundary.

Bt2—50 to 55 inches; brownish yellow (10YR 6/6) loamy sand, strong brown (7.5YR 4/6) moist; weak fine and medium subangular blocky structure; soft, friable; few fine and medium roots; common medium and coarse sand grains; very strongly acid; clear smooth boundary.

Bt3—55 to 65 inches; reddish yellow (7.5YR 7/6) loamy sand, yellowish red (5YR 5/8) moist; weak fine and medium subangular blocky structure; soft, friable; few fine roots; common medium and coarse sand grains; strongly acid; clear smooth boundary.

Bt4—65 to 74 inches; strong brown (7.5YR 5/8) loamy sand, strong brown (7.5YR 5/6) moist; weak fine and medium subangular blocky structure; soft, friable; few fine and medium roots; common clay bridging of sand grains; strongly acid; clear smooth boundary.

BCt—74 to 80 inches; strong brown (7.5YR 5/6) loamy sand, dark brown (7.5YR 4/4) moist; weak fine subangular blocky structure; soft, friable; few fine and medium roots; few clay bridges on sand grains; few medium and coarse sand grains; strongly acid.

The thickness of the solum ranges from 60 to more than 80 inches. Combined thickness of the A and E horizons is 40 to 60 inches. The content of clay in the control section ranges from 5 to 10 percent.

The A horizon is brown, grayish brown, light yellowish brown, or very pale brown. It has hue of 10YR, value of 5 to 7, and chroma of 2 to 4. Reaction ranges from extremely acid to slightly acid.

The E horizon is yellowish brown, brown, light brown, light yellowish brown, white, or very pale brown. The E horizon has hue of 10YR or 7.5YR, value of 5 to 8, and chroma of 2 to 6. The texture is sand or loamy sand. Reaction ranges from extremely acid to slightly acid.

The Bt horizon is yellowish brown, strong brown, reddish yellow, white, or yellowish red. It has hue of 5YR to 10YR, value of 5 to 8, and chroma of 2 to 8. Mottles in shades of brown, red, or gray range from none to common. The Bt horizon is continuous vertically and horizontally by clay bridging of sand grains. Reaction ranges from very strongly acid to slightly acid.

The BCt horizon is yellowish red, strong brown, yellowish brown, or light yellowish brown. It has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 2 to 8. The texture is loamy sand, but may include sand. Reaction ranges from moderately acid to slightly acid.

Knolle Series

The Knolle series consists of very deep, well drained, sandy soils on uplands (fig. 23). These soils formed in thick beds of sandy and loamy material weathered from sandstone. Slopes range from 2 to 5 percent.

Typical pedon of Knolle fine sand, 2 to 5 percent slopes; in Schulenburg, from the intersection of U.S. Highway 90 and U.S. Highway 77, 0.6 mile west on U.S. 90, 0.5 mile south on Farm Road 957, 0.1 mile west on South Street, and 40 feet north in pasture.

A1—0 to 9 inches; brown (10YR 5/3) fine sand, dark brown (10YR 4/3) moist; weak fine granular structure; loose, very friable; common fine roots; common fine pores; slightly acid; clear smooth boundary.

A2—9 to 13 inches; brown (10YR 5/3) fine sand, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; loose, very friable; common fine roots; few fine pores; slightly acid; clear smooth boundary.

Bt1—13 to 20 inches; dark brown (10YR 4/3) sandy loam; same color moist; common medium prominent dark red (2.5YR 3/6) and common medium faint brown (7.5YR 5/4) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; hard, firm; common fine roots; few fine pores; common distinct clay films on faces of peds; strongly acid; clear wavy boundary.

Bt2—20 to 35 inches; yellowish red (5YR 5/6) sandy clay, same color moist; common medium distinct dark red (2.5YR 3/6) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; hard, firm; few fine roots; common distinct clay films on faces of peds; strongly acid; clear smooth boundary.

Bt3—35 to 55 inches; yellowish red (5YR 5/6) sandy clay loam, same color moist; weak medium subangular blocky structure; hard, firm; few fine roots; few thin clay films on faces of peds; strongly acid; gradual smooth boundary.

C—55 to 80 inches; strong brown (7.5YR 5/6) sandy loam; same color moist; massive; slightly hard, very friable; lower part contains few thin yellowish brown (10YR 5/6) strata of clayey material; strongly acid.

The thickness of the solum ranges from 40 to 60 inches. Content of clay decreases to less than 20 percent of the maximum within a depth of 40 to 60 inches.

The A horizon is brown, dark grayish brown, grayish brown, or dark brown. It has hue of 10YR, value of 3 to 5, and chroma of 2 or 3. Reaction is moderately acid or slightly acid.

The upper part of the Bt horizon is brown, dark brown, strong brown, yellowish red, red, dark red, or reddish yellow. It has hue of 10YR, value of 3 to 6, and chroma of 3 to 8; and mottles in shades of brown, red, and yellow are common. The texture is sandy clay loam, clay loam, or sandy clay. Reaction ranges from strongly acid to slightly acid.

The lower part of the Bt horizon is brown, dark brown, strong brown, yellowish red, red, dark red, or reddish yellow. It has hue of 5YR to 10YR, value of 3 to 6, and chroma of 3 to 8; and mottles in shades of brown, red, and yellow are common. The texture is sandy clay loam, clay loam, or sandy clay. Reaction ranges from very strongly acid to slightly acid.

The C horizon is strong brown or reddish yellow. It has hue of 7.5YR, value of 5 or 6, and chroma of 6 or 8. The texture is loamy sand or sandy loam. Reaction ranges from strongly acid to slightly acid.

Koether Series

The Koether series consists of shallow, somewhat excessively drained, sandy soils on uplands. These soils formed in strongly cemented, coarse grain, tuffaceous sandstone. Slopes range from 2 to 5 percent.

Typical pedon of Koether loamy fine sand, 2 to 5 percent slopes, stony; in Muldoon, from the intersection of Farm Road 2237 and Farm Road 154, 3.6 miles north on Farm Road 154, 950 feet northwest on private road, 350 feet southwest along oil pipeline, and 30 feet northwest of oil pipeline intersection in wooded rangeland.

A—0 to 14 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; single grain; loose; many fine and medium roots; 50 percent sandstone rock fragments, 30 percent of which are stones; strongly acid; abrupt wavy boundary.

R—14 to 20 inches; white (10YR 8/1) strongly cemented tuffaceous sandstone; slightly fractured; many fine roots in fractures.

The thickness of the solum ranges from 10 to 20 inches, which corresponds to the depth to strongly cemented tuffaceous sandstone. Rock fragments of angular sandstone 3 to 30 inches across the long axis range from 35 to 70 percent within the solum.

The A horizon is light brownish gray, pale brown, or grayish brown. It has hue of 10YR, value of 5 or 6, and chroma of 2 or 3. Reaction is very strongly or strongly acid.

The R horizon is strongly cemented tuffaceous sandstone several feet thick containing a few fractures in the upper few inches.

Krum Series

The Krum series consists of very deep, well drained, clayey soils on nearly level terraces. These soils formed in calcareous clayey sediments. Slopes are 0 to 1 percent.

Typical pedon of Krum silty clay, rarely flooded; in La Grange, from the intersection of U.S. Highway 77 and Texas Highway 71, 4.4 miles north on U.S.

Highway 77, 0.9 mile west on county road, 0.42 mile southwest on county road, 0.51 mile west on county road, 0.5 mile south on private road, and 300 feet west of road in cultivated field.

Ap—0 to 7 inches; brown (7.5YR 5/2) silty clay, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure; extremely hard, very firm; common roots; few fine pores; few fragments of snail shells; strongly effervescent; moderately alkaline; abrupt smooth boundary.

A1—7 to 12 inches; dark brown (7.5YR 4/2) silty clay, dark brown (7.5YR 3/2) moist; moderate fine and medium subangular blocky structure; extremely hard, very firm; few fine and medium roots; few worm channels; few fragments of snail shells; few pressure faces; strongly effervescent; moderately alkaline; gradual wavy boundary.

A2—12 to 26 inches; brown (7.5YR 4/2) silty clay, dark brown (7.5YR 3/2) moist; moderate fine and medium angular blocky structure; extremely hard, very firm; few fine roots; few wormcasts and channels; few intersecting slickensides in lower part; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bw—26 to 65 inches; reddish brown (5YR 5/3) silty clay, reddish brown (5YR 4/3) moist; few dark vertical streaks; moderate medium angular blocky structure parting to moderate fine subangular blocky; extremely hard, very firm; few fine roots; few fine pores; few fine concretions of calcium carbonate; violently effervescent; moderately alkaline; gradual wavy boundary.

BCk—65 to 80 inches; light reddish brown (5YR 6/4) silty clay, reddish brown (5YR 4/4) moist; moderate medium angular blocky structure; extremely hard, very firm; few fine roots; common concretions of calcium carbonate; violently effervescent; moderately alkaline.

The thickness of the solum ranges to more than 60 inches. When the soil is dry, cracks more than 0.5 inch wide extend to a depth of 24 to 40 inches or more. The content of clay in the control section ranges from 40 to 60 percent. Calcium carbonate equivalent ranges from 10 to 30 percent with visible forms of calcium carbonate ranging from none to 2 percent of volume. The soil is moderately alkaline throughout.

The A horizon is dark grayish brown, brown, or dark brown. It has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 or 3.

The Bw horizon is reddish brown or brown. It has hue of 5YR or 7.5YR, value of 5, and chroma of 3 or 4.

The BCk horizon is pale brown, light brown, light reddish brown, or reddish yellow. It has hue of 5YR to 10YR, value of 6, and chroma of 3 to 6. The texture is silty clay or silty clay loam.

Kurten Series

The Kurten series consists of deep, well drained, loamy upland soils. These soils formed in mostly acidic deltaic shales and clays. Slopes range from 2 to 5 percent.

Typical pedon of Kurten very fine sandy loam, 2 to 5 percent slopes; in Cistern, from the intersection of Texas Highway 95 and Farm Road 2237, 2.8 miles west on County Road 208, 0.3 mile south on County Road 207, and 10 feet east of road along fence.

A—0 to 7 inches; pale brown (10YR 6/3) very fine sandy loam, brown (10YR 4/3) moist; weak fine granular structure; loose, very friable; many fine, medium, and coarse roots; strongly acid; abrupt wavy boundary.

Bt1—7 to 19 inches; red (2.5YR 4/6) clay, dark red (2.5YR 3/6) moist; few fine prominent dark grayish brown (10YR 4/2) and pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; very hard, very firm; common fine and medium roots; common thin continuous clay films on faces of peds; few fine ironstone pebbles; very strongly acid; gradual wavy boundary.

Bt2—19 to 32 inches; yellowish red (5YR 5/6) clay, yellowish red (5YR 4/6) moist; common medium prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; very hard, very firm; common fine roots; few fine black concretions; common thin discontinuous clay films on faces of peds; few fine ironstone pebbles; very strongly acid; gradual wavy boundary.

Bt3—32 to 48 inches; reddish brown (5YR 5/4) clay loam, reddish brown (5YR 4/4) moist; common medium distinct yellowish red (5YR 5/6) mottles; moderate medium subangular blocky structure; very hard, very firm; common thin discontinuous clay films on faces of peds; few fine concretions of calcium carbonate in lower part; slightly acid; clear smooth boundary.

C1—48 to 60 inches; mottled light gray (2.5Y 7/2) and yellow (10YR 7/8) clay loam, light brownish gray (2.5Y 6/2) and brownish yellow (10YR 6/8) moist; thin strata of strong brown iron enriched material; massive; very hard, firm; few concretions of calcium carbonate; few fine pockets of gypsum crystals; slightly alkaline.

C2—60 to 80 inches; mottled white (2.5Y 8/2) and light gray (2.5Y 7/2) clay loam, pale yellow (2.5Y 7/4) and light brownish gray (2.5Y 6/2) moist; common

fine and medium distinct olive yellow (2.5Y 6/8) mottles; massive; hard, firm; slightly alkaline.

The thickness of the solum ranges from 42 to 56 inches. Siliceous pebbles make up 2 to 30 percent of some horizons. COLE ranges from 0.07 to 0.10 in the upper 20 inches of the Bt horizon and has potential linear extensibility greater than 2.5 inches in the upper 50 inches of the soil.

The A horizon is brown, pale brown, or yellowish brown. It has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 3 to 6. Reaction ranges from strongly acid to neutral. The A horizon ranges from 2 to 8 inches in thickness, averaging about 7 inches.

The Bt1 horizon is red, yellowish red, or strong brown. It has hue of 2.5YR to 7.5YR, value of 4 or 5, and chroma of 4 to 8. Mottles in shades of red, brown, yellow, and gray range from none to common. Reaction ranges from very strongly acid to moderately acid.

The Bt2 horizon is dark red, red, yellowish red, strong brown, brown, or yellowish brown. It has hue of 2.5YR to 10YR, value of 3 to 5, and chroma of 2 to 8. Mottles in shades of red, brown, and gray range from none to common. Some pedons have common to many mudstone fragments. Reaction ranges from very strongly acid to neutral.

The Bt3 horizon is reddish brown, yellowish red, yellowish brown, brown, light olive brown, light yellowish brown, or light brownish gray. It has hue of 2.5YR to 2.5Y, value of 4 to 6, and chroma of 2 to 8. Mottles in shades of red, brown, gray, and olive range from few to many. Some pedons have common to many mudstone fragments. The texture is clay, silty clay loam, or clay loam. Reaction ranges from very strongly acid to neutral. Some pedons contain few concretions of calcium carbonate.

The C horizons have mottled colors in shades of brown, yellow, or gray. The texture is clay, clay loam, or loam. Gypsum crystals range from none to common and concretions of calcium carbonate range from none to few. Some pedons have common to many mudstone fragments. Reaction ranges from very strongly acid to slightly alkaline.

Latium Series

The Latium series consists of very deep, well drained, clayey soils on uplands. These soils formed in weakly consolidated calcareous clays and marls. Slopes range from 3 to 15 percent.

Typical pedon of Latium clay, 3 to 8 percent slopes; in Fayetteville, from the intersection of Texas Highway 159 and Farm Road 955, 0.63 mile southwest on Farm Road 955, and 100 feet south in pasture.

A—0 to 8 inches; dark grayish brown (10YR 5/2) clay, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; extremely hard, very firm; many fine and medium roots; few wormcasts and channels; few very fine concretions of calcium carbonate; few fine black concretions; few medium rounded siliceous pebbles; strongly effervescent; moderately alkaline; clear wavy boundary.

Bssk1—8 to 16 inches; light olive brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; moderate fine and medium subangular blocky structure; extremely hard, very firm; common fine roots; few wormcasts; few black concretions; common fine and medium concretions of calcium carbonate; common grooved intersecting slickensides; common dark grayish brown clay fill in old vertical cracks; violently effervescent; moderately alkaline; gradual wavy boundary.

Bssk2—16 to 35 inches; light olive brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; common medium faint grayish brown (2.5Y 5/2) and common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium angular blocky structure; extremely hard, very firm; few fine roots; few fine black concretions; common fine and medium concretions of calcium carbonate; few vertical streaks of dark grayish brown clay fill in old cracks; common grooved intersecting slickensides; violently effervescent; moderately alkaline; gradual wavy boundary.

Bssk3—35 to 60 inches; mottled light yellowish brown (10YR 6/4) light olive brown (2.5Y 5/4) clay; yellowish brown (10YR 5/4) and grayish brown (2.5Y 5/2) moist; common fine faint light brownish gray (2.5Y 6/2) mottles; moderate medium angular blocky structure; extremely hard, very firm; few fine roots; few fine black concretions; common fine and medium concretions and masses of calcium carbonate; few vertical streaks of dark grayish brown clay fill in old cracks; common grooved intersecting slickensides; violently effervescent; moderately alkaline; gradual wavy boundary.

BCk—60 to 80 inches; light yellowish brown (2.5Y 6/4) clay, light olive brown (2.5Y 5/4) moist; common medium faint light brownish gray (2.5Y 6/2) and yellowish brown (10YR 5/6) mottles; massive; extremely hard, very firm; few fine roots; few fine black concretions; common soft masses and concretions of calcium carbonate; few grooved intersecting slickensides; violently effervescent; moderately alkaline.

The thickness of the solum ranges from 40 to over 60 inches. It is clay throughout, and some areas have

a gravelly surface layer. The soil is calcareous and reaction is moderately alkaline throughout. The soil has cracks extending to a depth of more than 20 inches when dry, and untilled areas have gilgai microrelief.

The A horizon is very dark grayish brown, very dark gray, dark gray, dark grayish brown, olive gray, or dark olive gray. It has hue of 10YR to 5Y, value of 3 or 4, and chroma of 1 or 2. The A horizon is less than 12 inches thick in more than 50 percent of the pedon. A few concretions of calcium carbonate occur in some pedons.

The Bssk horizon is pale olive, olive, olive gray, light olive gray, light brownish gray, grayish brown, light olive brown, light gray, brown, yellowish brown, or light yellowish brown. It has hue of 10YR to 5Y, value of 5 to 7, and chroma of 2 to 4. Most pedons are mottled with these colors and old vertical cracks contain streaks of darker material. Intersecting slickensides are common beginning at a depth of 8 to 20 inches. Concretions and soft masses of calcium carbonate range from few to common.

The BCk horizon is light yellowish brown, light brownish gray, olive yellow, or light gray. It has hue of 10YR or 2.5Y, value of 6 or 7, and chroma of 2 to 6. Mottles are in shades of brown, yellow, olive, or gray. The texture is clay. Some pedons contain weathered marl and fragments of shale. Concretions and soft masses of calcium carbonate range from few to many.

Lufkin Series

The Lufkin series consists of very deep, moderately well drained, loamy soils on uplands. These soils formed in slightly acid to alkaline clayey sediments. Slopes range from 0 to 2 percent.

Typical pedon of Lufkin fine sandy loam, 0 to 2 percent slopes; in Round Top, from the intersection of Texas Highway 237 and Farm Road 1457, 2.67 miles north on Texas Highway 237, 3.24 miles northwest on county road, and 80 feet southeast in wooded area.

A—0 to 3 inches; brown (10YR 5/3) fine sandy loam, grayish brown (10YR 5/2) moist; weak fine granular structure; slightly hard, very friable; many fine, medium, and coarse roots; slightly acid; abrupt wavy boundary.

E—3 to 7 inches; light gray (10YR 7/2) fine sandy loam, light brownish gray (10YR 6/2) moist; massive; slightly hard, very friable; few fine roots; few fine siliceous pebbles; moderately acid; abrupt wavy boundary.

Btg1—7 to 20 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; few medium faint yellowish brown (10YR 5/4) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; extremely hard, very firm; common fine, medium, and coarse roots; common thick continuous very dark grayish brown clay films on faces of prisms; few fine black concretions; few fine siliceous pebbles; many shiny pressure faces in lower part; very strongly acid; gradual wavy boundary.

Btg2—20 to 43 inches; gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; moderate coarse angular blocky structure; extremely hard, very firm; few fine roots; common thick continuous clay films on faces of peds; few fine black concretions; few fine siliceous pebbles; common shiny pressure faces; moderately acid; gradual wavy boundary.

Btg3—43 to 66 inches; light gray (2.5Y 7/2) clay loam, same color moist; weak medium angular blocky structure; very hard, very firm; few fine roots; few fine pores; few concretions of calcium carbonate; few fine black concretions; few distinct patchy clay films on faces of peds; few fine siliceous pebbles; slightly alkaline; diffuse irregular boundary.

2C—66 to 80 inches; white (10YR 8/2) sandy clay loam, light gray (10YR 7/2) moist; massive; very hard, very firm; few streaks of gray (10YR 5/1) loamy material in upper part; few black masses; few white salt masses; few fine siliceous pebbles; slightly alkaline.

The thickness of the solum ranges to more than 60 inches.

The A horizon is brown, light brownish gray, grayish brown, or gray. It has hue of 10YR, value of 5 or 6, and chroma of 1 to 3.

The E horizon is gray, light gray, or light brownish gray. It has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 1 or 2. It is massive and hard when dry but has weak granular structure when moist.

The texture in the A and E horizons is fine sandy loam. Reaction is strongly acid to slightly acid. The combined thickness of the A and E horizons averages less than 10 inches.

The Btg1 and Btg2 horizons are dark gray, gray, dark grayish brown, grayish brown, or light brownish gray. They have hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. Mottles in shades of brown, olive, and yellow occur in some pedons. The texture is clay or clay loam. Content of clay ranges from 35 to 45 percent. Reaction is very strongly acid to slightly acid.

The Btg3 horizon is light gray and has hue of 2.5Y, value of 7, and chroma of 2. The texture is clay or clay loam. Content of clay is 35 to 45 percent. Reaction is moderately acid to slightly alkaline.

The 2C horizon is in various shades of white or gray with or without red, yellow, or brown mottles. The texture is loam, clay loam, or sandy clay loam. Most

pedons contain concretions of calcium carbonate and gypsum crystals. Reaction ranges from neutral to slightly alkaline. Some pedons have a C or BC horizon that has colors, texture, and reaction similar to the 2C horizon.

Luling Series

The Luling series consists of deep, well drained, clayey soils on uplands. These soils formed in stratified shales. Slopes range from 3 to 5 percent.

Typical pedon of Luling clay, 3 to 5 percent slopes; in Cistern, from the intersection of Farm Road 2237 and Texas Highway 95, 0.3 mile south on Texas Highway 95 to Farm Road 1115, 4.5 miles south and 2.3 miles west on Farm Road 1115 to county road, 2.0 miles west and northwest on county road, 0.7 mile north, 0.62 mile east on county road, and 100 feet south of county road in cultivated field.

Ap—0 to 6 inches; dark grayish brown (2.5Y 4/2) clay, very dark grayish brown (2.5Y 3/2) moist; moderate fine and medium angular blocky structure; extremely hard, very firm; common fine and medium roots; few fine black concretions; 8 percent ironstone pebbles; slightly alkaline; clear smooth boundary.

A—6 to 16 inches; very dark grayish brown (2.5Y 3/2) clay, very dark brown (10YR 2/2) moist; moderate fine and medium angular blocky structure; extremely hard, very firm; common fine and very fine roots; few fine black concretions; 6 percent ironstone pebbles; slightly alkaline; abrupt smooth boundary.

Bss—16 to 27 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate fine and medium angular blocky structure; extremely hard, very firm; few fine roots; common grooved intersecting slickensides; common dark grayish brown (2.5YR 4/2) vertical streaks of clayey material; few fine black concretions; 4 percent ironstone pebbles; slightly alkaline; gradual wavy boundary.

Bkss1—27 to 34 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate fine and medium angular blocky structure; extremely hard, very firm; few fine roots; common intersecting slickensides; few fine black concretions; common fine and few medium concretions of calcium carbonate; 2 percent ironstone pebbles; slightly effervescent; slightly alkaline; gradual wavy boundary.

Bkss2—34 to 53 inches; light olive gray (5Y 6/2) and pale olive (5Y 6/3) clay, olive gray (5Y 5/2) and olive (5Y 5/3) moist; common medium prominent light olive brown (2.5Y 5/4) mottles; moderate coarse angular blocky structure parting to moderate fine angular blocky; extremely hard, very firm; few fine roots; common intersecting slickensides; common dark colored fill in old cracks; few black concretions; common pockets of calcium carbonate concretions; few gypsum crystals; 2 percent coarse ironstone fragments; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—53 to 72 inches; light gray (5Y 7/2) bedded shale with clay texture, light olive gray (5Y 6/2) moist; massive; rock structure; few fine roots; few gypsum crystals; common streaks and thin strata of brownish yellow (10YR 6/8) iron-enriched material; slightly alkaline.

The thickness of the solum ranges from 50 to 60 inches. Content of clay in the 10- to 40-inch control section is 42 to 55 percent.

The A horizon is dark grayish brown, very dark grayish brown, or dark brown. It has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 2 or 3. The texture is clay. Reaction is neutral to moderately alkaline.

The Bss horizon or Bkss horizon are grayish brown, dark grayish brown, olive gray, light olive gray, or pale olive. They have hue of 10YR to 5Y, value of 4 to 6, and chroma of 2 to 4. Mottles in shades of gray, brown, and olive range from few to common. The texture is clay. Concretions of calcium carbonate range from none to common. Most pedons have fragments of ironstone. Gypsum crystals range from few to many. Reaction is slightly alkaline or moderately alkaline.

The C horizon is light brownish gray, grayish brown, gray, or light gray. It is shale that has texture of clay. Some pedons contain strata of reddish brown or brownish yellow ironstone. Gypsum crystals range from few to many. Reaction is neutral to moderately alkaline. Some pedons have a Cy horizon that has colors, texture, and reaction similar to the C horizon.

Navidad Series

The Navidad series consists of very deep, well drained, loamy soils on flood plains. These soils formed in loamy alluvium. Slopes are 0 to 1 percent.

Typical pedon of Navidad fine sandy loam, occasionally flooded; in La Grange, from the intersection of Texas Highway 71 and Farm Road 609, 2.7 miles southwest on Farm Road 609 to County Road 125, 1.5 miles northwest on County Road 125 to road curve, and 3,400 feet southwest of county road on flood plain of Buckners Creek.

Ap—0 to 6 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2)

moist; moderate fine and medium subangular blocky structure; hard, friable; many fine and medium roots; common fine pores; slightly alkaline; gradual wavy boundary.

A1—6 to 39 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure parting to weak fine granular; slightly hard, friable; common fine and medium roots; common fine and medium pores; neutral; gradual wavy boundary.

A2—39 to 45 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; slightly hard, friable; common fine and medium roots; common fine pores; few loam strata as much as 2 inches thick, very dark grayish brown (10YR 3/2) moist; neutral; clear wavy boundary.

C—45 to 80 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable; common fine roots; weakly stratified with layers as much as 1 inch thick of dark grayish brown (10YR 4/2) sandy clay loam and pale brown (10YR 6/3) loamy fine sand; neutral.

Depth of loamy and sandy sediments exceeds 80 inches. The A horizon ranges from 20 to 47 inches in thickness. The texture in the control section is dominantly fine sandy loam, although thin strata of loam, sandy clay loam, or loamy fine sand occur in the C horizon of most pedons. Reaction ranges from neutral to moderately alkaline.

The A horizon is grayish brown or dark grayish brown. It has hue of 10YR, value of 4 or 5, and chroma of 2.

The C horizon is brown, pale brown, dark yellowish brown, or dark grayish brown. It has hue of 10YR, value of 4 to 6, and chroma of 2 to 4. The more clayey strata or layers are darker in color.

Normangee Series

The Normangee series consists of deep, moderately well drained, loamy soils on uplands. These soils formed in alkaline clays and shales. Slopes range from 2 to 5 percent.

Typical pedon of Normangee clay loam, 2 to 5 percent slopes; in Cistern, from the intersection of Texas Highway 95 and Farm Road 2237, 0.3 mile south on Texas Highway 95, 6.0 miles south and west on Farm Road 1115, 120 feet north on county road, and 50 feet west in rangeland.

A—0 to 7 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; extremely hard, firm; common fine and medium roots; few worm channels and casts; few fine and medium ironstone pebbles; slightly acid; clear wavy boundary.

Bt1—7 to 20 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; few medium distinct reddish brown (5YR 4/4) mottles; moderate medium subangular blocky structure; extremely hard, very firm; common fine roots; common distinct clay films on faces of peds; few pressure faces; common cracks filled with dark grayish brown loamy material; few medium ironstone pebbles; neutral; gradual wavy boundary.

Bt2—20 to 29 inches; dark grayish brown (2.5Y 4/2) clay, dark grayish brown (2.5Y 4/2) moist; few fine distinct brownish yellow (10YR 6/6) mottles; moderate medium subangular blocky structure; extremely hard, very firm; few fine roots; common distinct clay films on faces of peds; common pressure faces; common cracks filled with dark grayish brown loamy material; few fine black concretions; few medium siliceous pebbles and few medium ironstone pebbles; slightly alkaline; clear wavy boundary.

Bt3—29 to 44 inches; light olive brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; few medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; extremely hard, very firm; few fine roots; common distinct clay films on faces of peds; many pressure faces; common cracks filled with dark grayish brown loamy material; few fine black concretions; few fine and medium concretions of calcium carbonate; few medium ironstone pebbles; moderately alkaline; gradual wavy boundary.

Btk—44 to 50 inches; light olive brown (2.5Y 5/4) clay, yellowish brown (10YR 5/4) moist; few medium faint yellowish brown (10YR 5/6) mottles; weak fine and medium subangular blocky structure; extremely hard, very firm; few fine roots; few faint clay films on faces of peds; common pressure faces; common cracks filled with dark grayish brown loamy material; few fine black concretions; common fine and medium concretions of calcium carbonate; few medium ironstone pebbles; few fragments of shale in lower part; moderately alkaline; clear wavy boundary.

Ck—50 to 65 inches; stratified brownish yellow (10YR 6/6) and light gray (5Y 7/2) weathered shale that has clay texture; common medium distinct strong brown (7.5YR 5/6) mottles; massive; extremely hard, very firm; few fine roots in upper part; few black masses; common pockets of fine and

medium concretions of calcium carbonate; few crystals of gypsum; few thin layers and fragments of ironstone and unweathered shale; moderately alkaline.

The thickness of the solum ranges from 40 to 60 inches. Siliceous and ironstone pebbles range from 0 to 5 percent throughout the solum. Loamy material is in old cracks throughout the Bt horizon.

The A horizon is dark grayish brown, brown, dark brown, or yellowish brown. It has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The texture is clay loam. Reaction is slightly acid or neutral. The boundary is wavy and the A horizon averages less than 10 inches in thickness.

The Bt1 horizon is brown, yellowish brown, dark brown, or dark yellowish brown. It has hue of 10YR, value of 4 or 5, and chroma of 3 or 4; and contains few or common mottles in shades of brown. The texture is clay. Reaction is moderately acid to neutral.

The lower Bt horizons are brown, grayish brown, dark grayish brown, light olive brown, yellowish brown, or olive brown. They have hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4; and contain few or common mottles in shades of brown or yellow. The texture is clay. Reaction ranges from neutral to moderately alkaline. Concretions of calcium carbonate range from few to common below a depth of 28 inches. Some pedons contain crystals of gypsum.

The C horizon is stratified and mottled in shades of brown, yellow, or gray. It is shale that has texture of clay or clay loam. Reaction is slightly or moderately alkaline.

Padina Series

The Padina series consists of very deep, well drained, sandy soils on uplands. These soils formed in thick sandy sediments. Slopes range from 2 to 5 percent.

Typical pedon of Padina fine sand, 2 to 5 percent slopes; in Cistern, from the intersection of Texas Highway 95 and Farm Road 2237, 0.3 mile south on Texas Highway 95 to Farm Road 1115, 0.8 mile south on Farm Road 1115, 2.3 miles west on county road, 0.7 mile south on county road, 2.3 miles west on county road, and 700 feet southwest in wooded area.

A—0 to 6 inches; yellowish brown (10YR 5/4) fine sand, yellowish brown (10YR 5/4) moist; single grain; loose, very friable; many fine, medium, and coarse roots; slightly acid; clear smooth boundary.

E—6 to 58 inches; very pale brown (10YR 7/4) fine sand, brown (10YR 5/3) moist; single grain; loose, very friable; many fine, medium, and coarse roots; slightly acid; clear wavy boundary.

Bt1—58 to 65 inches; light brownish gray (10YR 6/2) sandy clay loam, grayish brown (10YR 5/2) moist; many coarse prominent strong brown (7.5YR 5/8) and many coarse distinct yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; slightly hard, friable; many fine, medium, and coarse roots; few streaks and pockets of light brownish gray (10YR 6/2) uncoated sand; strongly acid; gradual smooth boundary.

Bt2—65 to 72 inches; white (10YR 8/2) sandy clay loam, same color moist; many coarse prominent strong brown (7.5YR 5/8), common medium prominent yellowish red (5YR 5/8) and common medium distinct yellowish brown (10YR 5/6) mottles; weak fine and medium subangular blocky structure; slightly hard, friable; common fine and medium roots; few lenses and pockets of light brownish gray (10YR 6/2) sand; strongly acid; gradual smooth boundary.

Bt3—72 to 80 inches; light gray (10YR 7/2) sandy clay loam, light brownish gray (10YR 6/2) moist; common coarse prominent strong brown (7.5YR 5/8) and common coarse prominent red (2.5YR 4/6) mottles; weak fine and medium subangular blocky structure; slightly hard, friable; common fine and medium roots, few pockets of light brownish gray (10YR 6/2) sand; strongly acid.

The thickness of the solum exceeds 80 inches.

The A horizon is light brownish gray, light yellowish brown, or yellowish brown. It has hue of 10YR, value of 5 or 6, and chroma of 2 to 4.

The E horizon is pale brown or very pale brown. It has hue of 10YR, value of 6 or 7, and chroma of 3 or 4. An E/B horizon is in some pedons. The B material is brownish yellow lamellae.

The texture of the A and E horizons is fine sand. Reaction is slightly acid or neutral. The combined thickness of the A and E horizons is 40 to 72 inches.

The Bt horizons are in shades of red, yellow, and gray. They have hue of 5YR to 10YR, value of 5 to 8, and chroma of 1 to 8. Mottles in shades of red, yellow, brown, and gray range from few to many. The texture in the upper Bt horizon is sandy clay loam and the texture in the lower Bt horizon is sandy clay loam or fine sandy loam and contains less than 15 percent uncoated sand grains. Reaction is strongly acid.

Pursley Series

The Pursley series consists of very deep, well drained, loamy soils on flood plains. These soils

formed in recent calcareous, loamy alluvium. Slopes are 0 to 1 percent.

Typical pedon of Pursley clay loam, frequently flooded; in Schulenburg, from the intersection of U.S. Highway 90 and U.S. Highway 77, 0.6 mile west on U.S. Highway 90, 1.4 miles southwest on Farm Road 957, and 200 feet southeast of creek.

A—0 to 14 inches; dark grayish brown (10YR 4/2) clay loam, very dark gray (10YR 3/1) moist; moderate coarse subangular blocky structure parting to weak fine granular; very hard, firm; common fine roots; few fine snail shell fragments; slightly effervescent; slightly alkaline; clear smooth boundary.

Bw1—14 to 23 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; hard, friable; few fine roots; few fine pores; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bw2—23 to 34 inches; grayish brown (10YR 5/2) loam, dark gray (10YR 4/1) moist; weak medium subangular blocky structure; slightly hard, friable; few fine roots; few fine pores; strongly effervescent; moderately alkaline; clear wavy boundary.

C1—34 to 48 inches; grayish brown (10YR 5/2) clay loam, dark gray (10YR 3/1) moist; massive; very hard, firm, few fine roots; few fine snail shells; violently effervescent; moderately alkaline; clear wavy boundary.

C2—48 to 56 inches; dark grayish brown (10YR 4/2) clay loam, dark grayish brown (10YR 4/2) moist; massive; very hard, firm; few fine roots; few fine snail shell fragments; violently effervescent; moderately alkaline; gradual wavy boundary.

C3—56 to 69 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (10YR 4/2) moist; massive; hard, friable; few thin strata of sandy material; violently effervescent; moderately alkaline; clear wavy boundary.

C4—69 to 80 inches; grayish brown (10YR 5/2) clay loam, dark gray (10YR 4/1) moist; massive; hard, friable; few fine snail shell fragments; violently effervescent; moderately alkaline.

The thickness of the solum ranges up to 36 inches. The texture in the 10- to 40-inch control section is clay loam that has thin strata of sandy, loamy, or clayey materials. Silicate clay content is 18 to 35 percent. Some pedons have a few black concretions. The soil is calcareous. Reaction is slightly or moderately alkaline.

The A horizon is grayish brown, dark brown, or dark grayish brown. It has hue of 7.5YR to 2.5Y, value of 4 or 5, and chroma of 2. The texture is clay loam. The mollic epipedon ranges from 10 to 20 inches in thickness.

The Bw horizon is grayish brown or light brownish gray. It has hue of 10YR or 2.5Y, value of 4 to 7, and chroma of 2. The texture is loam or clay loam. It commonly contains thin lenses, pockets, and strata of sandy, loamy, or clayey materials.

The C horizon is gray, grayish brown, dark grayish brown, light brownish gray, very pale brown, or pale brown. It has hue of 10YR or 2.5Y, value of 4 to 7, and chroma of 2 or 3. It has strata ranging from sandy to clayey, but on the average the texture is loam or clay loam. In some pedons, buried darker colored loamy or clayey soils are below a depth of 40 inches.

Rabbs Series

The Rabbs series consists of very deep, well drained, loamy soils that formed in calcareous loamy alluvial sediments. These soils are on escarpments between flood plains and first level terraces. Slopes range from 5 to 8 percent.

Typical pedon of Rabbs clay loam, 5 to 8 percent slopes; in La Grange, from the intersection of U.S. Highway 77 and Texas Highway 71, 1.6 miles west on Texas Highway 71, 3.1 miles northwest on county road, 0.8 mile north on county road, 0.5 mile east on private road and 125 feet north of fence in rangeland.

A—0 to 6 inches; dark brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2) moist; moderate fine and medium subangular blocky structure; hard, firm; many fine, medium, and coarse roots; common wormcasts filled with Bk horizon material; slightly effervescent; moderately alkaline; clear smooth boundary.

Bk1—6 to 18 inches; reddish brown (5YR 5/4) clay loam, reddish brown (5YR 4/4) moist; strong fine subangular blocky structure; hard, firm; common fine and medium roots; 10 percent calcium carbonate concretions 0.5 inch in diameter; many wormcasts and channels; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk2—18 to 38 inches; light reddish brown (5YR 6/4) clay loam, reddish brown (5YR 5/4) moist; moderate fine and very fine subangular blocky structure; hard, firm; common fine and medium roots; 15 percent calcium carbonate concretions 0.5 inch in diameter; few wormcasts and channels; strongly effervescent; moderately alkaline; diffuse smooth boundary.

BCk1—38 to 46 inches; reddish yellow (5YR 6/6) loam, yellowish red (5YR 5/6) moist; weak fine subangular blocky structure; slightly hard, friable;

common fine and medium roots; 5 percent calcium carbonate concretions and threads; strongly effervescent; moderately alkaline; diffuse smooth boundary.

BCk2—46 to 80 inches; reddish yellow (5YR 6/6) loam, yellowish red (5YR 5/6) moist; weak coarse subangular blocky structure; loose, friable; few fine roots; 5 percent calcium carbonate concretions and threads; strongly effervescent; moderately alkaline.

The thickness of the solum ranges from 60 to more than 80 inches. The soil is moderately alkaline throughout. Siliceous pebbles range from 0 to 10 percent in some horizons.

The A horizon is brown or dark brown and is less than 10 inches thick. It has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 to 4. Calcium carbonate equivalent ranges from 5 to 15 percent.

The Bk horizon is reddish brown, brown, light brown, light reddish brown, reddish brown, or pink. It has hue of 5YR, 7.5YR or 10YR, value of 5 to 7, and chroma of 3 to 8. The texture is loam, sandy clay loam, or clay loam and contains 10 to 20 percent visible secondary carbonates in the form of soft masses, concretions, films, and threads. Calcium carbonate equivalent is 15 to 40 percent.

The BCk horizon is reddish brown, brown, light brown, light reddish brown, or pink. It has hue of 5YR, 7.5YR or 10YR, value of 5 to 7, and chroma of 3 to 8. The texture is loam or sandy clay loam and contains 5 to 10 percent visible secondary carbonates in the form of masses, concretions, films, and threads. Calcium carbonate equivalent ranges from 5 to 15 percent.

Rehburg Series

The Rehburg series consists of deep, moderately well drained, sandy soils on uplands. These soils formed in residuum weathered from beds of stratified tuffaceous sandstone, clays, and loamy materials. Slopes range from 1 to 3 percent.

Typical pedon of Rehburg loamy fine sand, 1 to 3 percent slopes; in La Grange, from the intersection of Texas Highway 71 and Farm Road 609, 5.9 miles southwest on Farm Road 609, 0.68 mile north on county road and 45 feet west of fence in wooded area.

A—0 to 8 inches; brown (10YR 5/3) loamy fine sand, dark brown (10YR 4/3) moist; single grain; loose; many fine and medium roots; moderately acid; clear smooth boundary.

E—8 to 26 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; single grain; loose; many fine and medium roots; strongly acid; abrupt wavy boundary.

Bt1—26 to 34 inches; light brownish gray (2.5Y 6/2) sandy clay, grayish brown (2.5Y 5/2) moist; common medium prominent brownish yellow (10YR 6/6) and strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, very firm; common fine and few medium roots; common thick patchy clay films on faces of prisms; common uncoated sand grains on faces of prisms; few fine black concretions and stains; very strongly acid; gradual wavy boundary.

Bt2—34 to 44 inches; light gray (2.5Y 7/2) sandy clay loam, light brownish gray (2.5Y 6/2) moist; common medium prominent brownish yellow (10YR 6/6) and reddish yellow (5YR 6/6) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; very hard, very firm; few fine roots; common thin patchy clay films on faces of prisms; few black concretions; very strongly acid; gradual wavy boundary.

Bt3—44 to 56 inches; light gray (2.5Y 7/2) sandy clay loam, light brownish gray (2.5Y 6/2) moist; few medium distinct light yellowish brown (2.5Y 6/4) mottles; moderate medium subangular blocky structure; very hard, very firm; few fine roots; few thin patchy clay films on faces of prisms; few fine black concretions; few fine white salt crystals; strongly acid; clear wavy boundary.

Cr—56 to 65 inches; light yellowish brown (2.5Y 6/4) weakly cemented tuffaceous sandstone, light olive brown (2.5Y 5/4) moist; and bedded pale olive (5Y 6/3) clay, olive (5Y 5/3) moist; few medium prominent yellowish brown (10YR 5/8) mottles; very hard, firm; few fine roots; few fine black concretions; few fine and medium white salt crystals; neutral.

The thickness of the solum ranges from 44 to 60 inches, which corresponds to the depth to the paralithic contact. The combined thickness of the A and E horizons ranges from 20 to 40 inches. The content of clay in the control section ranges from 25 to 35 percent.

The A horizon is dark grayish brown, grayish brown, brown, or pale brown. It has hue of 10YR, value of 4 to 6, and chroma of 2 or 3. The texture is loamy fine sand. Reaction is moderately acid or slightly acid.

The E horizon is light gray, light brownish gray, very pale brown, or pale brown. It has hue of 10YR, value of 5 to 7, and chroma of 2. The texture is loamy fine sand. Reaction ranges from strongly acid to slightly acid.

The Bt horizon is light gray, light brownish gray, or grayish brown. It has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 2. Mottles are in shades of yellow, brown, or red. The texture in the upper part of the

horizon is clay, clay loam, or sandy clay and the clay content ranges from 30 to 50 percent. The clay content decreases in the lower part of the Bt horizon where it is sandy clay loam, sandy clay, or clay loam. Reaction ranges from very strongly acid to moderately acid.

The Cr horizon ranges from weakly to strongly cemented tuffaceous sandstone to massive and compact tuffaceous loamy and clayey material. Most areas are interbedded with various amounts of these materials.

Rek Series

The Rek series consists of very deep, moderately well drained, gravelly, loamy soils on high Pleistocene terraces. These soils formed in stratified loamy, clayey, and siliceous gravel deposits. The soil is desurfaced. Slopes range from 2 to 5 percent.

Typical pedon of Rek extremely gravelly coarse sandy loam, 2 to 5 percent slopes; in Fayetteville, from the intersection of Farm Road 159 and Farm Road 1291, 1.8 miles north on Farm Road 1291, 2,000 feet northeast on private gravel road, and 200 feet northwest in desurfaced area.

Ap—0 to 3 inches; pink (7.5YR 7/4) extremely gravelly coarse sandy loam, brown (7.5YR 5/4) moist; massive; soft, loose; many fine and few medium and coarse roots; 5 percent cobbles and 75 percent siliceous pebbles; very strongly acid; abrupt wavy boundary.

Bt1—3 to 7 inches; red (2.5YR 4/6) gravelly clay, red (2.5YR 4/6) moist; many medium prominent light brownish gray (10YR 6/2) and few fine distinct yellowish brown mottles; moderate medium prismatic structure parting to moderate medium angular blocky; extremely hard, very firm; few coarse and common fine and medium roots; common thick continuous light gray (10YR 6/1) clay films on faces of peds; many thick continuous dark red (2.5YR 3/6) clay films on rock fragments; 5 percent cobbles and 25 percent siliceous pebbles; extremely acid; clear wavy boundary.

Bt2—7 to 12 inches; light gray (10YR 7/1) clay, gray (10YR 6/1) moist; many coarse prominent red (10R 4/8) and few fine prominent light red (2.5YR 6/6) mottles; weak medium prismatic structure parting to moderate coarse angular blocky; extremely hard, very firm; few coarse, common fine and medium roots; common thick continuous light gray (10YR 6/1) clay films on faces of peds; 2 percent cobbles and 5 percent siliceous pebbles; extremely acid; clear wavy boundary.

Bt3—12 to 22 inches; light gray (10YR 7/1) clay, gray (10YR 6/1) moist; many coarse prominent dark red (10R 3/6) and many medium prominent red (10R 4/6) mottles; weak medium prismatic structure parting to moderate coarse angular blocky; extremely hard, very firm; common fine and medium roots; few medium pores; common distinct discontinuous patchy gray (10YR 6/1) clay films on faces of peds; 5 percent siliceous pebbles in lower part; extremely acid; gradual wavy boundary.

2Bt4—22 to 37 inches; light brownish gray (2.5Y 6/2) sandy clay, gray (2.5Y 5/2) moist; common medium prominent dark red (10R 3/6) and common medium distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate coarse angular blocky; extremely hard, very firm; common fine and medium roots; few medium pores; many distinct continuous light gray (10YR 6/1) clay films on faces of peds; 2 percent siliceous pebbles; extremely acid; gradual smooth boundary.

2Bt5—37 to 49 inches; light gray (2.5Y 7/2) sandy clay loam, light brownish gray (2.5Y 6/2) moist; many medium prominent dark red (10R 3/6), few fine prominent brownish yellow (10YR 5/6) and common brownish yellow (10YR 6/6) mottles; moderate medium prismatic structure parting to moderate coarse angular blocky; very hard, very firm; few fine and medium roots; few medium pores; many thick continuous light brownish gray (10YR 6/2) clay films on faces of peds; common dark gray (10YR 4/1) stains along root channels and vertical faces of peds; extremely acid; gradual smooth boundary.

2Bt6—49 to 63 inches; light gray (2.5Y 7/2) sandy clay loam, light brownish gray (2.5Y 6/2) moist; many medium prominent dark red (10R 3/6) and few fine prominent brownish yellow mottles; moderate medium prismatic structure parting to moderate coarse angular blocky; very hard, very firm; few fine and medium roots; many thick continuous light brownish gray (2.5Y 6/2) clay films on vertical faces of peds; common dark gray (10YR 4/1) stains along root channels; extremely acid; abrupt irregular boundary.

2Cr—63 to 80 inches; grayish brown (2.5Y 5/2) weakly cemented sandstone that has fine sandy loam texture, grayish brown (2.5Y 5/2) moist; common coarse prominent yellowish red (5YR 5/6) and common medium prominent red (2.5YR 4/8) mottles; few fine and medium roots along fracture planes, 12 to 20 inches apart; few dark gray (10YR 4/1) stains on vertical faces of prisms; extremely acid.

The thickness of the solum ranges from 50 to more than 80 inches. Rounded siliceous pebbles and cobbles are on the surface and in the Bt1, Bt2, and Bt3

horizons. They average less than 35 percent in the control section. Quartz pebbles, mainly less than 1 centimeter in diameter, range from few to many throughout the argillic horizon. COLE is less than 0.07. Base saturation, at 50 inches below the top of the argillic horizon or immediately above a paralithic contact, ranges from 15 to 35 percent.

The A horizon is brown, light brown, pale brown, light yellowish brown, dark yellowish brown, pink, strong brown, yellowish brown, or reddish yellow. It has hue of 7.5YR or 10YR, value of 4 to 7, and chroma of 3 to 6. The texture is variable, consisting of extremely gravelly loamy coarse sand, extremely gravelly loamy sand, or extremely gravelly coarse sandy loam. Pebbles and cobbles range from 65 to 80 percent. About 5 to 10 percent of the volume of the coarse fraction is composed of cobbles, mainly less than 5 inches across the long axis. Reaction ranges from extremely acid to strongly acid.

The Bt1 horizon is gray, grayish brown, light gray, light brownish gray, pinkish gray, reddish gray, reddish brown, light reddish brown, pink, reddish pink, red, dark red, light red, pale red, weak red, yellowish red, or reddish yellow. The Bt1 horizon has hue of 2.5YR to 10YR, value of 3 to 7, and chroma of 1 to 6. Few to many mottles are in shades of red, gray, brown, or yellow. The texture is gravelly clay or gravelly sandy clay. Coarse fragments range from 15 to 35 percent. Reaction ranges from extremely acid to strongly acid.

The Bt2 and Bt3 horizons have hue of 2.5YR to 10YR, value of 3 to 7, and chroma of 1 to 6. Mottles in shades of red, gray, brown, or yellow are few to many. The texture is sandy clay or clay. Coarse fragments range from 0 to 15 percent. Reaction ranges from extremely acid to slightly acid.

The 2Bt horizons are gray, light gray, light brownish gray, pale brown, very pale brown, light yellowish brown, pale yellow, or white. They have hue of 10YR or 2.5Y, value of 6 to 8, and chroma of 1 to 4. Mottles in shades of red, gray, brown, or yellow are few to common. The texture is sandy clay loam, clay loam, or sandy clay. Some pedons have as much as 15 percent pebbles. Reaction ranges from extremely acid to slightly acid.

The 2Cr horizon is in shades of gray, white, or brown. It has hue of 10YR to 5Y, value of 5 to 8, and chroma of 1 to 3. Few mottles in shades of red are in most pedons. This horizon consists of shale or weakly cemented sandstone. The texture is sandy loam, sandy clay loam, sandy clay, or clay. Siliceous pebbles range from 1 to 3 percent. Reaction ranges from extremely acid to slightly acid. Some pedons have a 2C horizon that has the same color, texture, and reaction as the 2Cr horizon.

Renish Series

The Renish series consists of shallow, well drained, loamy soils on uplands (fig. 24). These soils formed in beds of strongly cemented calcareous sandstone. Slopes range from 2 to 20 percent.

Typical pedon of Renish fine sandy loam, in an area of Renish-Rock outcrop complex, 2 to 8 percent slopes; in La Grange, from the intersection of Texas Highway 71 and Farm Road 159, 2.9 miles northeast on Farm Road 159, 0.6 mile northwest, 0.2 mile northeast, and 75 feet northeast of fence in an area of live oaks.

A1—0 to 7 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; hard, friable; common fine and medium roots; few fine fragments of sandstone; strongly effervescent; slightly alkaline; clear smooth boundary.

A2—7 to 12 inches; dark brown (10YR 4/3) fine sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; hard, friable; common fine and medium roots; few fragments of weathered sandstone; strongly effervescent; slightly alkaline; abrupt irregular boundary.

R—12 to 15 inches; strongly cemented calcareous sandstone that is coarsely fractured; fractures contain soil material and roots.

The thickness of the solum ranges from 12 to 20 inches thick, which corresponds to the depth to sandstone bedrock. Calcareous fragments of sandstone range from 0 to 30 percent.

The A horizon is very dark grayish brown, dark grayish brown, or dark brown. It has hue of 10YR, value of 3 to 5, and chroma of 2 or 3. The texture is fine sandy loam, gravelly fine sandy loam, or sandy clay loam. The soil is calcareous and reaction is slightly or moderately alkaline.

The R horizon, or bedrock, in shades of white or brown, consists of calcareous, indurated sandstone that has a hardness of greater than 3 on Mohs scale. It is coarsely fractured and contains thin horizontal layers of softer material.

Robco Series

The Robco series consists of very deep, moderately well drained, very gently sloping, sandy soils on uplands. These soils formed in loamy and clayey sediments. Slopes range from 1 to 3 percent.

Typical pedon of Robco fine sand, 1 to 3 percent slopes; in Muldoon, from the intersection of Farm Road

154 and Farm Road 2237, 4.0 miles south on Farm Road 154, 1.5 miles west on county road, 0.7 mile north, 1.6 miles west, 80 feet north of county road in wooded area.

A—0 to 8 inches; pale brown (10YR 6/3) fine sand, dark brown (10YR 4/3) moist; weak fine granular structure; loose, very friable; many fine, medium, and coarse roots; common very fine pores; slightly acid; gradual smooth boundary.

E—8 to 28 inches; very pale brown (10YR 7/3) fine sand, pale brown (10YR 6/3) moist; common medium distinct brownish yellow (10YR 6/6) mottles; single grain; loose, very friable; many fine, medium, and coarse roots; common fine pores; slightly acid; clear smooth boundary.

Bt/E—28 to 35 inches; yellowish brown (10YR 5/6) sandy clay loam (B part); common coarse distinct light brownish gray (10YR 6/2) mottles; 30 percent of horizon is tongues and interfingers of light gray (10YR 7/2) loamy fine sand (E part); weak medium subangular blocky structure; slightly hard, friable; common fine roots; few fine pores; few distinct patchy clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt1—35 to 49 inches; light brownish gray (10YR 6/2) sandy clay loam; grayish brown (2.5Y 5/2) moist; many medium prominent red (2.5YR 4/6) and strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate medium angular blocky; very hard, very firm; few fine and medium roots; few fine pores; common thick patchy clay films on faces of peds; very strongly acid; gradual smooth boundary.

Bt2—49 to 56 inches; mottled yellowish red (7.5YR 5/6) and light brownish gray (2.5Y 6/2) sandy clay loam, moderate medium prismatic structure parting to moderate medium angular blocky; very hard, very firm; few fine roots; few fine pores; common distinct patchy clay films on faces of peds; strongly acid; gradual smooth boundary.

Bt3—56 to 68 inches; very pale brown (10YR 7/4) sandy clay loam, light yellowish brown (10YR 6/4) moist; common medium prominent reddish yellow (7.5YR 6/6) and light brownish gray (2.5Y 6/2) mottles; weak fine and medium subangular blocky structure; hard, friable; few thin patchy clay films on faces of peds; strongly acid; gradual wavy boundary.

BC—68 to 74 inches; mottled light brownish gray (2.5YR 6/2) and reddish yellow (7.5YR 6/8) sandy clay loam; weak medium subangular blocky structure; slightly hard; friable; few mica flakes; slightly acid.

The thickness of the solum ranges from 60 to more than 80 inches. Content of clay in the upper 20 inches of the argillic horizon averages 25 to 35 percent.

The A horizon is light yellowish brown or pale brown. It has hue of 10YR, value of 6, and chroma of 3 or 4. The texture is fine sand or loamy fine sand.

The E horizon is pale brown, very pale brown, or light yellowish brown. It has hue of 10YR, value of 6 or 7, and chroma of 3 or 4.

The combined thickness of the A and E horizons is 20 to 40 inches. They have mottles in shades of gray or yellow that range from none to common. Reaction is moderately acid or slightly acid.

The Bt/E horizon is 60 to 90 percent Bt materials. The texture is sandy clay loam, loam, or clay loam. The Bt part has hue of 10YR, value of 5 to 7, and chroma of 4 to 6. The texture in the E part of the horizon is loamy fine sand or fine sand. The tongues and interfingers of E material are light gray and very pale brown. The E part has hue of 10YR, value of 7, and chroma of 2 or 4. Mottles are in shades of gray, yellow, or red. Reaction is very strongly acid to moderately acid.

The Bt horizons are gray, grayish brown, light brownish gray, very pale brown, light gray, or light yellowish brown. They have hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 2 to 4. Mottles are in shades of red, yellow, brown, and gray. They range from few to many, or the matrix is mottled in shades of red, gray, and yellow. The texture is sandy clay loam or clay loam. Reaction ranges from very strongly acid to moderately acid. Some pedons have interfingering and tonguing of E material in the lower part.

The BC horizon is in shades of red, gray, yellow, or brown with few to many mottles. The texture is variable and ranges from sandy clay loam to clay loam. Reaction ranges from very strongly acid to neutral. Gypsum and other salt masses range from none to common. Some pedons do not have a BC horizon.

Roetex Series

The Roetex series consists of very deep, somewhat poorly drained, clayey soils on flood plains of the Colorado River. These soils formed in clayey alluvium. Slopes are 0 to 1 percent.

Typical pedon of Roetex clay, frequently flooded; in La Grange, from the intersection of U.S. Highway 77 and Texas Highway 71, 1.6 miles south on U. S. Highway 77, 9.2 miles southeast on Farm Road 155, 1.2 miles east on county road to intersection with north and south county road, and 4,850 feet east of intersection in center of old channel.

A—0 to 11 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate fine and medium angular blocky structure; very hard, very firm; common fine and medium roots; common wormcasts and channels; few snail shell fragments; few discontinuous lenses of brownish loamy material; strongly effervescent; moderately alkaline; clear smooth boundary.

Bw—11 to 33 inches; reddish gray (5YR 5/2) clay, dark reddish gray (5YR 4/2) moist; common medium faint dark gray (5YR 4/1) and few fine prominent yellowish brown (10YR 5/6) mottles; common strata of dark grayish brown (10YR 4/2); moderate fine and medium angular blocky structure; very hard, very firm; few fine and medium roots; few wormcasts and channels; few loamy discontinuous bedding planes and lenses; few fine black concretions; few snail shell fragments; common pressure faces in the lower part; few grooved intersecting slickensides; strongly effervescent; moderately alkaline; clear smooth boundary.

Bss1—33 to 41 inches; reddish brown (5YR 4/3) clay, dark reddish brown (5YR 3/3) moist; common medium faint dark gray (5YR 4/1) mottles; moderate medium subangular blocky structure; very hard, very firm; few fine and medium roots; few fine black concretions; few snail shell fragments; common pressure faces; common grooved intersecting slickensides; few very dark gray streaks; violently effervescent; moderately alkaline; clear smooth boundary.

Bss2—41 to 72 inches; brown (7.5YR 5/2) clay, dark brown (7.5YR 4/2) moist; common medium distinct strong brown (7.5YR 5/6) and gray (5YR 5/1) mottles; moderate medium subangular blocky structure; extremely hard, very firm; few fine roots; few fine black concretions; few snail shell fragments; common fine and medium concretions and few threads of calcium carbonate; common pressure faces; common grooved intersecting slickensides; violently effervescent; moderately alkaline.

The thickness of the solum ranges from 60 to about 80 inches. It is dominantly clay and has a few thin strata of silt loam or silty clay loam scattered throughout. The soil is calcareous and moderately alkaline. Intersecting slickensides and pressure faces begin at a depth of 12 to 20 inches. Content of clay in the 10- to 40-inch control section ranges from 60 to 72 percent.

The A horizon is dark grayish brown, dark brown, dark reddish gray, reddish brown, or weak red. It has hue of 2.5YR to 10YR, value of 3 or 4, and chroma of 2 or 3.

The Bw and Bss horizons are reddish gray, reddish brown, brown, or dark brown. They have hue of 2.5YR to 7.5YR, value of 4 or 5, and chroma of 2 to 4. Grayish and brownish mottles range from few to common. The texture is clay.

Some pedons have a C horizon that is stratified clay, silty clay, or silty clay loam, and some C horizons have strata of sand and silt loam. Some pedons have buried A horizons in the control section.

Rutersville Series

The Rutersville series consists of deep, moderately well drained, sandy soils formed in material weathered from tuffaceous sandstone (fig. 25). These soils are on nearly level uplands. Slopes range from 0 to 2 percent.

Typical pedon of Rutersville loamy fine sand, 0 to 2 percent slopes; in Muldoon, from the intersection of Farm Road 154 and Farm Road 2237, 3.75 miles south on Farm Road 154 to county road, 0.9 mile east on county road, and 200 feet south in pasture.

Ap—0 to 7 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; loose, very friable; many fine, medium, and coarse roots; few fine and medium pores; neutral; clear smooth boundary.

E—7 to 14 inches; white (10YR 8/2) loamy fine sand, light brownish gray (10YR 6/2) moist; common coarse prominent brown (10YR 4/3) mottles; weak medium subangular blocky structure; loose; very friable; many fine, medium, and coarse roots; few fine and medium pores; neutral; abrupt smooth boundary.

Bt1—14 to 24 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; moderate coarse prismatic structure parting to moderate medium angular blocky; very hard, firm, few fine and medium roots; common fine and medium pores; common thick continuous grayish brown (10YR 5/2) clay films on vertical faces of peds; common grayish brown (2.5Y 5/2) vertical streaks; strongly acid; clear smooth boundary.

Bt2—24 to 34 inches; light brownish gray (2.5Y 6/2) sandy clay loam, grayish brown (2.5Y 5/2) moist; few fine distinct yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure parting to moderate medium angular blocky; very hard, firm; common fine and medium roots; few fine and medium pores; common thick continuous brown (10YR 4/3) clay films on vertical faces of

peds; few masses of barite; very strongly acid; clear smooth boundary.

Bt3—34 to 46 inches; light brownish gray (2.5Y 6/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; common medium distinct yellowish brown (10YR 5/8) mottles; moderate coarse prismatic structure parting to weak fine angular blocky; slightly hard, friable; common fine and medium roots; few fine and medium pores; common thick continuous dark grayish brown (2.5Y 4/2) clay films on vertical faces of peds; 3 to 5 percent fine masses of barite; strongly acid; clear smooth boundary.

BC—46 to 54 inches; light gray (2.5Y 7/2) fine sandy loam, light brownish gray (2.5Y 6/2) moist; common medium distinct brownish yellow (10YR 5/8) mottles; weak coarse subangular blocky structure; slightly hard, friable; common fine roots; few fine and medium pores; common thick patchy grayish brown (2.5Y 5/2) clay films on vertical faces of peds; few stains of iron and manganese; few fine masses of barite; moderately acid; abrupt wavy boundary.

Cr1— 54 to 65 inches; weakly cemented and weathered light gray (2.5Y 7/2) sandstone, light gray (2.5Y 7/2) moist; common medium distinct olive yellow (2.5Y 6/6) mottles; massive; few fine roots along fracture planes; common thick patchy dark grayish brown (2.5Y 4/2) clay films on faces of coarse fragments; 40 to 50 percent of matrix stained with iron and manganese coatings; thin discontinuous olive yellow (2.5Y 6/6) strata; common masses of barite; few red (2.5YR 5/8) brittle masses; slightly acid; clear wavy boundary.

Cr2—65 to 79 inches; weakly cemented and weathered, yellowish red (5YR 5/6) and light gray (2.5Y 7/2) stratified sandstone; common brownish yellow (10YR 6/8) and few red (2.5YR 4/8) loamy lenses; massive; few fine roots along fractures; few fine pores; distinct bedding planes; few discontinuous ironstone lenses; slightly acid.

The thickness of the solum ranges from 40 to 60 inches, and corresponds to the depth to weathered bedrock. Content of clay in the Bt horizon averages 20 to 35 percent. Exchangeable sodium in the B horizon ranges from 2 to 15 percent. Reaction ranges from very strongly acid to moderately alkaline.

The A horizon is dark grayish brown, grayish brown, light brownish gray, brown, pale brown, or very pale brown. The E horizon is grayish brown, light brownish gray, light gray, or white. The A and E horizons have hue of 10YR, value of 4 to 8, and chroma of 2 or 3. The texture is loamy fine sand. The A and E horizons are very strongly acid to neutral and combined thickness is 8 to 20 inches.

The Bt horizons are dark gray, gray, light gray, light brownish gray, grayish brown, or dark grayish brown. They have hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 or 3. They have common to many mottles in shades of yellow, brown, and red. The amount of mottling throughout the horizons decreases in abundance and size with depth.

The texture in the Bt1 horizon is sandy clay loam, clay loam, sandy clay, or clay. Content of clay is 35 to 45 percent. The texture in the Bt2 horizon is fine sandy loam, loam, or sandy clay loam. Content of clay is 20 to 27 percent. In the Bt1 and Bt2 horizons, reaction ranges from very strongly acid to slightly acid.

The texture in the Bt3 horizon and the BC horizon is fine sandy loam, loam, or sandy clay loam. Content of clay is 15 to 25 percent. Some pedons have a few small concretions of calcium carbonate and white salts. In the Bt3 and BC horizons, reaction ranges from strongly acid to moderately alkaline.

The Cr horizon is weakly cemented to strongly cemented sandstone. Some pedons contain thin lenses and pockets of tuffaceous shale. The cemented sandstone is fractured and the fractures contain masses of roots and organic stains. A few concretions of calcium carbonate and white salts are in some pedons. Reaction ranges from slightly acid to moderately alkaline.

Schulenburg Series

The Schulenburg series consists of very deep, well drained, loamy soils that formed in materials weathered from weakly consolidated sandstones. These soils are on gently sloping to moderately sloping uplands. Slopes range from 3 to 8 percent.

Typical pedon of Schulenburg sandy clay loam, 3 to 8 percent slopes; in La Grange, from the intersection of U.S. Highway 77 and Texas Highway 71, 13.2 miles south on U.S. Highway 77, 0.4 mile east on ranch road, 0.3 mile north along fence line, and 50 feet east in pasture.

A1—0 to 5 inches; dark gray (10YR 4/1) sandy clay loam, very dark gray (10YR 3/1) moist; moderate medium subangular blocky structure; slightly hard, friable; many fine roots; few fine pores; slightly acid; clear smooth boundary.

A2—5 to 13 inches; dark grayish brown (10YR 4/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, friable; many fine roots; common fine and medium pores; slightly acid; clear smooth boundary.

Bt1—13 to 19 inches; brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 4/4) moist; moderate

medium subangular blocky structure; hard, firm; common fine roots; few fine pores; common thin patchy clay films on faces of peds; neutral; gradual smooth boundary.

Bt2—19 to 29 inches; brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure parting to moderate fine subangular blocky; hard, firm; common fine roots; few fine pores; common thin patchy clay films on faces of peds; neutral; gradual wavy boundary.

Btk1—29 to 36 inches; dark brown (7.5YR 3/4) sandy clay loam, dark brown (7.5YR 3/4) moist; strong medium angular blocky structure; hard, firm; common fine roots; common fine pores; common thin patchy clay films on faces of peds; 2 percent calcium carbonate as fine threads, 5 percent threads and concretions of calcium carbonate; strongly effervescent; moderately alkaline; gradual wavy boundary.

Btk2—36 to 42 inches; dark brown (7.5YR 3/4) sandy clay loam, dark brown (7.5YR 3/4) moist; strong coarse subangular blocky structure parting to moderate medium subangular blocky; very hard, firm; few fine roots; 20 percent fine and medium calcium carbonate concretions; strongly effervescent; moderately alkaline; gradual wavy boundary.

Btk3—42 to 49 inches; brown (7.5YR 4/4) sandy clay loam, brown (7.5YR 4/4) moist; strong medium subangular blocky structure; very hard, firm; few fine roots; common fine pores; few fine wormcasts; 15 percent masses and concretions of calcium carbonate; violently effervescent; moderately alkaline; clear wavy boundary.

Btk4—49 to 57 inches; yellowish brown (10YR 5/6) sandy clay loam, yellowish brown (10YR 5/8) moist; weak coarse subangular blocky structure; hard, friable; few fine roots; common fine and medium pores; few fine wormcasts; 7 percent fine threads, masses and concretions of calcium carbonate; common fine fragments of brown (7.5YR 4/4) material; violently effervescent; moderately alkaline; gradual wavy boundary.

BCk—57 to 80 inches; brownish yellow (10YR 6/6) very fine sandy loam, yellowish brown (10YR 5/6) moist; weak coarse prismatic structure; hard, friable; few fine pores; 7 percent fine threads and concretions of calcium carbonate; strongly effervescent; moderately alkaline.

The thickness of the solum ranges from 60 to more than 80 inches. Depth to masses and threads of calcium carbonate ranges from 22 to 36 inches. The content of clay in the control section ranges from 20 to 35 percent. Coarse fragments range up to 15 percent. The mollic epipedon is 10 to 20 inches thick.

The A horizon is brown, dark brown, dark grayish brown, grayish brown, very dark grayish brown, dark gray, or very dark gray. It has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 1 or 2. It is sandy clay loam. The content of clay ranges from 15 to 25 percent. Reaction is slightly acid or neutral.

The Bt horizons are brown, dark brown, dark grayish brown, dark reddish brown, dark yellowish brown, reddish brown, very dark grayish brown, or dark reddish gray. They have hue of 5YR to 10YR, value of 3 to 5, and chroma of 2 to 4. The texture is sandy clay loam or clay loam. Reaction is slightly acid or neutral.

The Btk horizons are brown, light brown, light reddish brown, reddish brown, strong brown, or yellowish brown. They have hue of 5YR to 10YR, value of 3 to 6, and chroma of 2 to 6. The texture is sandy clay loam or clay loam. Calcium carbonate equivalent ranges from 5 to 25 percent.

The BCk horizon is brown, light brown, light reddish brown, reddish brown, strong brown, brownish yellow, or yellowish brown. It has hue of 10YR to 5YR, value of 4 to 6, and chroma of 2 to 6. Content of clay ranges from 10 to 20 percent. Calcium carbonate equivalent ranges from 5 to 25 percent. Reaction is moderately alkaline.

Some pedons have a C horizon that is variable and ranges from weakly consolidated calcareous sandstone to massive calcareous loamy or sandy materials.

Shalba Series

The Shalba series consists of shallow, moderately well drained, loamy soils on uplands (fig. 26). These soils formed in strongly cemented tuffaceous fine grained sandstone. Slopes range from 2 to 8 percent.

Typical pedon of Shalba fine sandy loam, 2 to 5 percent slopes; in Muldoon, from the intersection of Farm Road 154 and Farm Road 2237, 1.2 miles northeast on Farm Road 154, and 650 feet northwest in pasture.

A—0 to 5 inches; light brownish gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) moist; weak fine granular structure; slightly hard, very friable; common fine, medium, and coarse roots; strongly acid; abrupt wavy boundary.

Bt—5 to 16 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; moderate medium angular blocky structure; extremely hard, very firm; common fine and medium roots;

common distinct clay films on faces of peds; few fine black concretions; common pressure faces; moderately acid; abrupt smooth boundary.

Cr—16 to 24 inches; white (2.5Y 8/2) strongly cemented tuffaceous sandstone; massive with bedding planes; neutral.

The thickness of the solum ranges from 14 to 20 inches, which corresponds to the depth to strongly cemented tuffaceous sandstone.

The A horizon is grayish brown or light brownish gray. It has hue of 10YR, value of 5 or 6, and chroma of 2. The texture is fine sandy loam. Reaction is strongly or moderately acid.

The Bt horizon is brown, dark brown, dark grayish brown, grayish brown, very dark grayish brown, reddish brown, gray, dark gray, very dark gray, or dark reddish gray. It has hue of 5YR, 7.5YR, or 10YR, value of 3 to 5, and chroma of 1 to 4. Mottles in shades of gray range from few to many. The texture is clay. Reaction is strongly acid or moderately acid.

The Cr horizon is in shades of white or gray. It is strongly cemented tuffaceous sandstone that has a texture ranging from sandy loam to clay loam. Mottles and streaks in shades of yellow and brown are common. Reaction ranges from moderately acid to slightly alkaline.

Ships Series

The Ships series consists of very deep, moderately well drained, clayey soils on flood plains of the Colorado River. These soils formed in clayey alluvial sediments. Slopes are 0 to 1 percent.

Typical pedon of Ships clay, occasionally flooded; in La Grange, from the intersection of U.S. Highway 77 and Texas Highway 71, 14.1 miles west on Texas Highway 71, 0.2 mile northeast on county road to railroad crossing, 0.2 mile north, and 70 feet east of road in cultivated field.

Ap—0 to 5 inches; dark reddish brown (5YR 3/2) clay, dark reddish brown (5YR 2/2) moist; moderate fine and medium angular blocky structure; extremely hard, very firm; few fine and medium roots; few worm channels; few fragments of snail shells; strongly effervescent; moderately alkaline; gradual wavy boundary.

A—5 to 31 inches; dark reddish brown (5YR 3/2) clay, dark reddish brown (5YR 2/2) moist; moderate fine angular blocky structure; extremely hard, very firm; few fine roots; few wormcasts and channels; few fragments of snail shells; few grooved intersecting slickensides below a depth of 15 inches; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bss1—31 to 58 inches; reddish brown (5YR 4/3) clay, dark reddish brown (5YR 3/3) moist; common dark vertical streaks as much as 0.5 inch wide; moderate fine subangular blocky structure; extremely hard, very firm; few fine roots; few fine and medium concretions of calcium carbonate; common grooved intersecting slickensides; few fragments of snail shells; violently effervescent; moderately alkaline; gradual wavy boundary.

Bss2—58 to 80 inches; reddish brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) moist; moderate fine subangular blocky structure; extremely hard, very firm; few fine roots; few fine concretions of calcium carbonate; common grooved intersecting slickensides; violently effervescent; moderately alkaline.

The thickness of the solum ranges to more than 60 inches. When the soil is dry, cracks more than 0.5 inch wide extend to a depth of 40 inches or more. The content of clay in the 10- to 40-inch control section ranges from 60 to 80 percent. The soil is calcareous and moderately alkaline throughout.

The A horizon is dark reddish brown, dark reddish gray, reddish gray, brown, or dark brown. It has hue of 5YR or 7.5YR, value of 3 to 5, and chroma of 2 or 3. The texture is clay.

The Bss horizons are reddish brown, light reddish brown, or light brown. They have hue of 5YR or 7.5YR, value of 3 to 6, and chroma of 3 or 4. The texture is clay, but can range to silty clay in the Bss2 horizon. Some pedons have strata of loamy textures.

Shiro Series

The Shiro series consists of moderately deep, moderately well drained, sandy soils on uplands. These soils formed in tuffaceous clays and sandstones. Slopes range from 1 to 3 percent.

Typical pedon of Shiro loamy fine sand, 1 to 3 percent slopes; in La Grange, from the intersection of Texas Highway 71 and Farm Road 609, 8.6 miles southwest on Farm Road 609, 1.6 miles north on county road, and 250 feet east in pasture.

A—0 to 3 inches; brown (10YR 5/3) loamy fine sand, dark brown (10YR 4/3) moist; weak fine granular structure; loose, very friable; many fine and medium roots; strongly acid; clear smooth boundary.

E—3 to 12 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; weak fine granular structure; loose, very friable; many fine and medium roots; strongly acid; abrupt wavy boundary.

Bt1—12 to 20 inches; reddish yellow (7.5YR 6/6) sandy clay, same color moist; common medium distinct red (2.5YR 5/6) and grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate medium angular blocky; extremely hard, very firm; common fine and medium roots; common thick discontinuous clay films on faces of peds; common lenses of uncoated sand grains on faces of peds; few black concretions and stains; strongly acid; gradual wavy boundary.

Bt2—20 to 32 inches; light brownish gray (10YR 6/2) sandy clay, grayish brown (10YR 5/2) moist; few fine and medium prominent yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; extremely hard, very firm; common fine and medium roots; common thick discontinuous clay films on faces of peds; common lenses of uncoated sand grains on faces of peds; few fine black concretions; moderately acid; gradual wavy boundary.

BC—32 to 38 inches; light gray (10YR 7/2) sandy clay, light brownish gray (10YR 6/2) moist; common masses of pale yellow (2.5Y 7/4) partly weathered tuffaceous material, light yellowish brown (2.5Y 6/4) moist; moderate coarse subangular blocky structure; very hard, very firm; few fine roots; slightly acid; clear smooth boundary.

Cr—38 to 65 inches; white (2.5Y 8/2) weakly cemented sandstone, light gray (2.5Y 7/2) moist; common fine and medium prominent yellow (2.5Y 7/6) mottles; few roots confined to soil material; few thin brittle chalky strata in lower part; slightly acid.

The thickness of the solum ranges from 20 to 40 inches, and corresponds to the depth to paralithic contact. The combined thickness of the A and E horizons ranges from 10 to 18 inches. Content of clay in the control section ranges from 35 to 45 percent.

The A horizon is brown, grayish brown, light brownish gray, or pale brown. It has hue of 10YR, value of 5 or 6, and chroma of 2 or 3. The texture is loamy fine sand. Reaction ranges from strongly acid to slightly acid.

The E horizon is light brownish gray, pale brown, or very pale brown. It has hue of 10YR, value of 6 or 7, and chroma of 2 or 3. The texture is loamy fine sand. Reaction ranges from strongly acid to slightly acid.

The Bt1 horizon is reddish yellow, brownish yellow, yellow, very pale brown, light brown, or light yellowish brown. It has hue of 7.5YR or 10YR, value of 6 or 7, and chroma of 4 to 6. Mottles in shades of gray, red, and brown range from common to many. The texture is clay or sandy clay. Reaction is very strongly or strongly acid.

The Bt2 and BC horizons are grayish brown, light brownish gray, or light gray. They have hue of 10YR, value of 5 to 7, and chroma of 1 or 2. Mottles in shades of red, yellow, or brown range from few to many. The texture is clay, sandy clay, or clay loam. Reaction ranges from very strongly acid to neutral.

The Cr horizon is weakly to strongly cemented tuffaceous sandstone or siltstone that has texture of sandy clay loam or silt loam that is interbedded with loamy or clayey materials. Reaction ranges from slightly acid to moderately alkaline.

Singleton Series

The Singleton series consists of moderately deep, moderately well drained, loamy soils on uplands. These soils formed in tuffaceous materials. Slopes range from 1 to 3 percent.

Typical pedon of Singleton fine sandy loam, 1 to 3 percent slopes; in La Grange, from the intersection of U.S. Highway 77 and Texas Highway 71, 2.7 miles north on U.S. Highway 77, 10.1 miles northeast on Farm Road 2145, 1.6 miles north on Farm Road 1291, 2.4 miles west on county road, 1.4 miles southwest, and 60 feet southeast of road in scattered post oaks.

Ap—0 to 5 inches; light brownish gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) moist; few fine distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; hard, very friable; common fine roots; strongly acid; abrupt smooth boundary.

E—5 to 7 inches; light gray (10YR 7/2) fine sandy loam, light brownish gray (10YR 6/2) moist; massive; hard, very friable; few fine roots; common fine and medium pores; strongly acid; abrupt wavy boundary.

Bt1—7 to 17 inches; dark brown (10YR 4/3) clay, dark grayish brown (10YR 4/2) moist; few medium faint yellowish brown (10YR 5/4) mottles; weak coarse prismatic structure parting to moderate fine and medium angular blocky; extremely hard, very firm; few fine roots; few thin clay films on faces of peds; common shiny pressure faces; very strongly acid; gradual wavy boundary.

Bt2—17 to 24 inches; dark brown (10YR 4/3) on the outside of peds, grayish brown (10YR 5/2) on the inside, and clay, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to moderate medium and coarse angular blocky; extremely hard, very firm; few fine roots; common thick clay films on faces of peds; few shiny pressure faces; strongly acid; clear wavy boundary.

BC—24 to 33 inches; light brownish gray (10YR 6/2) and white (2.5Y 8/2) sandy clay loam, grayish

brown (10YR 5/2) and light gray (2.5Y 7/2) moist; few medium prominent brownish yellow (10YR 6/6) mottles; weak medium angular blocky structure; very hard, firm; few fine roots; common dark grayish brown (10YR 4/2) stains; few fine roots; neutral; clear wavy boundary.

Cr—33 to 55 inches; white (10YR 8/2) weakly cemented tuffaceous sandstone, light gray (10YR 7/2) moist; common coarse and medium distinct pale yellow (2.5Y 7/4) mottles; soft and brittle in upper part, becoming hard with depth; few fine roots along fractures in upper part; neutral.

The thickness of the solum ranges from 20 to 40 inches, and corresponds to the depth to weakly cemented tuffaceous material. Siliceous pebbles range from none to few throughout the pedon.

The A horizon is very pale brown, pale brown, light brownish gray, or grayish brown. The E horizon is light gray or light brownish gray. The A and E horizons have hue of 10YR, value of 5 to 7, and chroma of 2 or 3. The texture is fine sandy loam. Reaction is strongly or moderately acid. Combined thickness of the A and E horizons ranges from 3 to 8 inches.

The Bt horizons are brown, dark brown, or pale brown. They have hue of 10YR, value of 4 to 6, and chroma of 3. Mottles are in shades of brown, yellow, or red and range from none to common. The texture is clay or clay loam. Content of clay ranges from 35 to 50 percent. Reaction is very strongly or strongly acid.

The BC horizon is brown, grayish brown, light brownish gray, or light brown. It has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 or 3. Mottles in shades of brown or yellow range from none to common. The texture is clay loam or sandy clay loam. Thin discontinuous strata or masses of slightly weathered sandstone range from few to common in most horizons. Reaction ranges from moderately acid to neutral.

The Cr horizon is weakly to strongly cemented tuffaceous sandstone or siltstone that has texture of sandy clay or clay loam in shades of white, gray, brown, or olive. Some pedons contain many concretions or masses of calcium carbonate. Reaction ranges from moderately acid to moderately alkaline.

Smithville Series

The Smithville series consists of very deep, well drained, loamy soils on high bottom lands and low stream terraces. These soils formed in loamy alluvium. Slopes are 0 to 1 percent.

Typical pedon of Smithville fine sandy loam, 0 to 1 percent slopes; in La Grange, from the intersection of U.S. Highway 77 and Texas Highway 71, 14.8 miles west on Texas Highway 71, 0.3 mile southwest on county road, 700 feet south on field road, and 60 feet east in cropland.

Ap—0 to 12 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; hard, friable; common fine and medium roots; common fine pores; neutral; abrupt smooth boundary.

Bt1—12 to 21 inches; very dark grayish brown (10YR 3/2) sandy clay loam, very dark brown (10YR 2/2) moist; moderate fine subangular blocky structure; hard, friable; common fine roots; few patchy clay films on faces of peds; common fine pores; neutral; clear smooth boundary.

Bt2—21 to 38 inches; reddish brown (5YR 4/3) sandy clay loam, dark reddish brown (5YR 3/3) moist; moderate medium subangular blocky structure; hard, firm; few fine roots; common patchy clay films on faces of peds; common fine and medium pores; neutral; gradual smooth boundary.

Btk—38 to 49 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; weak fine and medium subangular blocky structure; hard, friable; few fine roots; common fine pores; common threads and few fine concretions of calcium carbonate; few patchy clay films on faces of peds; strongly effervescent; slightly alkaline; diffuse smooth boundary.

BCk—49 to 75 inches; reddish yellow (7.5YR 6/6) loam, strong brown (7.5YR 5/6) moist; weak fine and medium subangular blocky structure; slightly hard, friable; few fine roots; few fine pores; few fine concretions, soft masses, and threads of calcium carbonate; strongly effervescent; moderately alkaline.

The thickness of the solum ranges from 50 to more than 80 inches. The mollic epipedon is 26 or more inches thick and includes the upper part of the Bt horizon. The average clay content of the control section ranges from 18 to 32 percent.

The Ap horizon is dark brown, dark grayish brown, very dark grayish brown, or grayish brown. It has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 or 3. The texture is fine sandy loam. Reaction is neutral or slightly alkaline.

The Bt horizon is dark brown, very dark grayish brown, or reddish brown. It has hue of 5YR to 10YR, value of 3 or 4, and chroma of 2 to 4. The texture is sandy clay loam or loam. Reaction ranges from neutral to moderately alkaline.

The Btk and BCk horizons are strong brown, reddish yellow, reddish brown, or yellowish red. They have hue

of 5YR or 7.5YR, value of 5 or 6, and chroma of 3 to 6. The texture is fine sandy loam, loam, or sandy clay loam. Visible forms of calcium carbonate comprise 1 to 10 percent.

Straber Series

The Straber series consists of very deep, moderately well drained, sandy soils that formed in alkaline clayey and loamy materials. These soils are on gently sloping to moderately sloping uplands. Slopes range from 2 to 8 percent.

Typical pedon of Straber loamy fine sand, 2 to 5 percent slopes; in Schulenburg, from intersection of U.S. Highway 90 and Farm Road 957, 3.5 miles south on Farm Road 957, and 80 feet west.

A—0 to 8 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; weak fine granular structure; loose, very friable; common fine roots; few siliceous pebbles; moderately acid; clear smooth boundary.

E—8 to 14 inches; very pale brown (10YR 7/3) loamy fine sand, pale brown (10YR 6/3) moist; single grain; loose, very friable; few fine roots; few siliceous pebbles; moderately acid; abrupt wavy boundary.

Bt1—14 to 24 inches; brownish yellow (10YR 6/6) sandy clay, yellowish brown (10YR 5/6) moist; common medium distinct light gray (10YR 7/2) and yellowish red (10YR 6/6) mottles; moderate medium angular blocky structure parting to weak very fine subangular blocky; extremely hard, very firm, sticky and plastic; few fine roots; common clay films on faces of peds; strongly acid; gradual wavy boundary.

Bt2—24 to 42 inches; light gray (2.5Y 7/2) sandy clay; light brownish gray (2.5Y 6/2) moist; common medium distinct brownish yellow (10YR 6/6) and strong brown (7.5YR 5/6) mottles; weak coarse angular blocky structure; extremely hard, very firm, sticky and plastic; few fine roots; many light brownish gray (10YR 6/2) clay films on faces of peds; 10 percent siliceous pebbles; strongly acid; gradual wavy boundary.

Bt3—42 to 59 inches; light gray (2.5Y 7/2) sandy clay, light brownish gray (2.5Y 6/2) moist; common coarse distinct yellowish brown (10YR 5/4) and few fine prominent red (2.5YR 4/6) mottles; moderate medium prismatic structure parting to weak coarse angular blocky; extremely hard, very firm, sticky and plastic; few fine roots; few thin clay films on faces of peds; neutral; clear wavy boundary.

Bk—59 to 65 inches; light gray (2.5Y 7/2) clay loam, light brownish gray (2.5Y 6/2) moist; moderate medium angular blocky structure; very hard, firm; common soft masses of calcium carbonate; slightly alkaline; gradual wavy boundary.

BCk—65 to 80 inches; pale yellow (5Y 7/3) clay loam, pale olive (5Y 6/3) moist; weak medium subangular blocky structure; hard, firm; common soft masses of calcium carbonate; strongly effervescent; moderately alkaline.

The thickness of the solum ranges from 60 to more than 80 inches. Base saturation is 40 to 75 percent by sum of cations in the upper part of the argillic horizon. The boundary between the E and Bt horizons is abrupt over the subsoil crests and clear over the deeper subsoil troughs. The texture change is abrupt. Siliceous pebbles range from none to 15 percent.

The A and E horizons are brown, grayish brown, pale brown, very pale brown, light gray, or light brownish gray. They have hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 2 or 3. The texture is loamy fine sand and gravelly loamy fine sand. In some pedons the E horizon is mottled in contrasting colors. Reaction is moderately acid or slightly acid.

The Bt1 horizon is light brownish gray, light gray, pale brown, brownish yellow, light yellowish brown, yellowish brown, grayish brown, or strong brown. It has hue of 7.5YR to 2.5Y, value of 5 to 7, and chroma of 2 to 8. Mottles are in shades of gray, brown, yellow, or red. The texture is sandy clay or clay.

The Bt2 and Bt3 horizons are in shades of brown, gray, yellow, or olive. They have hue of 10YR, 2.5Y, or 5y; value of neutral to 7; and chroma of 1 to 6. Mottles are in shades of red, yellow, brown, gray, and olive. The texture is sandy clay, clay loam, or sandy clay loam.

Reaction is very strongly acid or strongly acid in the Bt1 and Bt2 horizons and ranges from very strongly acid to slightly alkaline in the Bt3 horizon.

The Bk and BCk horizons are light brownish gray or light gray. They have hue of 10YR to 2.5Y, value of 6 or 7, and chroma of 2 to 6. Mottles in shades of gray, brown, yellow, or red are in some pedons. The texture is sandy clay loam, clay loam, or sandy clay. Reaction is slightly or moderately alkaline. Soft masses of calcium carbonate range from none to common.

Tremona Series

The Tremona series consists of very deep, somewhat poorly drained, sandy soils on uplands. These soils formed in interbedded sandy, clayey, and loamy materials. Slopes range from 1 to 3 percent.

Typical pedon of Tremona loamy sand, 1 to 3 percent slopes; in La Grange, from the intersection of U.S. Highway 77 and Texas Highway 71, 3.15 miles west on Texas Highway 71, 1.5 miles southwest on

county road, 0.2 mile southeast on county road, and 180 feet north along fence in wooded pasture.

A—0 to 9 inches; pale brown (10YR 6/3) loamy sand, dark brown (10YR 4/3) moist; single grain; loose, very friable; many fine roots; 5 percent fine siliceous pebbles; strongly acid; clear smooth boundary.

E—9 to 26 inches; very pale brown (10YR 7/3) fine sand, pale brown (10YR 6/3) moist; single grain; loose, very friable; common fine roots; 10 percent fine siliceous pebbles in lower part of horizon; strongly acid; abrupt wavy boundary.

Btg1—26 to 34 inches; light brownish gray (2.5Y 6/2) clay, grayish brown (2.5YR 5/2) moist; many coarse prominent dark yellowish brown (10YR 4/6) and strong brown (7.5YR 5/8) mottles; moderate fine and medium angular blocky structure; extremely hard, very firm; common fine roots; common fine white concretions; common distinct patchy clay films on faces of peds; 3 percent fine siliceous pebbles; very strongly acid; gradual wavy boundary.

Btg2—34 to 42 inches; mottled light brownish gray (10YR 6/2), brownish yellow (10YR 6/6) and yellowish brown (10YR 5/6) sandy clay, grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) moist; common medium distinct strong brown (7.5YR 5/6) mottles; moderate medium angular blocky structure; extremely hard, very firm; common fine and medium roots; common distinct patchy clay films on faces of peds; common white concretions; 3 percent fine siliceous pebbles; very strongly acid; gradual wavy boundary.

Btg3—42 to 54 inches; mottled light gray (10YR 7/2), yellowish brown (10YR 5/8), and strong brown (7.5YR 5/8) sandy clay; few fine reddish mottles; weak fine and medium subangular blocky structure; hard, friable; few fine roots; common thin patchy clay films on faces of peds; few fine concretions and soft masses of calcium carbonate; many fine and medium barite concretions; moderately acid; gradual wavy boundary.

Btk—54 to 62 inches; light gray (2.5Y 7/2) sandy clay loam, light brownish gray (2.5Y 6/2) moist; common medium prominent yellowish red (5YR 5/6) and strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; hard, friable; few fine roots; few thin patchy clay films on faces of peds; few fine concretions of calcium carbonate; 5 percent fine siliceous pebbles; moderately alkaline.

Ck—62 to 80 inches; light gray (2.5Y 7/2) sandy clay loam, light brownish gray (2.5Y 6/2) moist; common fine and medium prominent strong brown (7.5YR 5/6) and common fine and medium distinct yellowish brown (10YR 5/6) mottles; massive; 5 percent fine and medium siliceous pebbles; neutral.

The thickness of the solum ranges to more than 60 inches. Siliceous pebbles range from 0 to 15 percent throughout the Bt horizons.

The combined thickness of the A and E horizons is 20 to 40 inches. The A horizon is grayish brown, light gray, or pale brown and has hue of 10YR, value of 5 to 7, and chroma of 2 or 3. The texture is loamy sand. Reaction is strongly acid to slightly acid. The E horizon is light gray, pale brown, or very pale brown and has hue of 10YR, value of 6 or 7, and chroma of 2 to 4. Reaction is strongly acid to slightly acid. The boundary between the E and Bt horizons is clear to abrupt.

The Btg horizon is gray, light gray, light brownish gray, or grayish brown. It has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 1 or 2. In some pedons, some horizons have a mottled matrix in shades of gray, yellow, or brown. Mottles in shades of red, yellow, brown, or gray range few to many. The texture is clay or sandy clay. Clay content in the control section ranges from 40 to 50 percent. Reaction is very strongly acid to moderately acid.

The Btk and C horizons are light brownish gray, light gray, gray, or grayish brown. They have hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 1 or 2. Mottles in shades of red, yellow, or brown range from few to common. The texture is clay, sandy clay, or sandy clay loam. Reaction ranges from strongly acid to moderately alkaline. Some layers have none to common masses and concretions of calcium carbonate.

Trinity Series

The Trinity series consists of very deep, somewhat poorly drained, clayey soils on flood plains. These soils formed in alkaline clayey alluvium. Slopes are 0 to 1 percent.

Typical pedon of Trinity clay, occasionally flooded; in La Grange, from the intersection of U.S. Highway 77 and Texas Highway 71, 1.6 miles south on U.S. Highway 77, 3.5 miles south on Farm Road 155 to county road, 0.5 mile south on county road to field road, 0.1 mile east on field road, and 50 feet south in meadow.

Ap—0 to 5 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate fine and medium subangular blocky structure; extremely hard, very firm; many fine and medium roots; few shiny ped faces; few fragments of snail shells; strongly effervescent; slightly alkaline; clear smooth boundary.

A—5 to 22 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate fine and medium angular blocky structure; extremely hard, very firm;

common fine roots; common shiny ped faces; few fragments of snail shells; strongly effervescent; slightly alkaline; gradual wavy boundary.

Bss—22 to 47 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate coarse angular blocky structure parting to moderate fine and medium angular blocky; extremely hard, very firm; few fine roots; many tilted and grooved intersecting slickensides; many shiny pressure faces; few fragments of snail shells; strongly effervescent; slightly alkaline; gradual wavy boundary.

Bkss1—47 to 67 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; common medium faint grayish brown (10YR 5/2) mottles; moderate coarse angular blocky structure parting to moderate fine and medium angular blocky; extremely hard, very firm; few fine roots; many tilted and grooved intersecting slickensides; many shiny pressure faces; common fine concretions of calcium carbonate; few fine black concretions; few vertical streaks of very dark gray (10YR 3/1) clay; violently effervescent; slightly alkaline; gradual wavy boundary.

Bkss2—67 to 80 inches; gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; common medium distinct dark gray (10YR 4/1) mottles; moderate coarse angular blocky structure parting to moderate fine and medium angular blocky; extremely hard, very firm; many tilted and grooved intersecting slickensides; many shiny pressure faces; few vertical streaks of very dark gray (10YR 3/1) clay; common fine concretions of calcium carbonate; few fine black concretions; violently effervescent; moderately alkaline.

The thickness of the solum ranges from 60 to more than 80 inches. Clay content in the control section ranges from 60 to 80 percent. When dry, cracks extend to a depth of 40 inches or more. Intersecting slickensides are in the upper part of the control section and increase in size and number with depth. Cycles of microdepressions of microknolls are in undisturbed areas, and microknolls are 2 to 6 inches higher than the microdepressions. The soil is calcareous and slightly or moderately alkaline throughout.

The A horizon is very dark gray or black. It has hue of 10YR, value of 2 or 3, and chroma of 1. In some pedons, mottles in shades of yellow or brown are in the lower part of the horizon.

The Bss and Bkss horizons are dark gray, gray, very dark gray, or grayish brown. They have hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 1 or 2. Mottles in shades of yellow, brown, or olive range from few to many in the lower part of the horizon.

Uhland Series

The Uhland series consists of very deep, moderately well drained, loamy soils on flood plains. These soils formed in alluvial sediments. Slopes are 0 to 1 percent.

Typical pedon of Uhland clay loam, frequently flooded; in Muldoon, from the intersection of Farm Road 154 and Farm Road 2237, 4.3 miles west on Farm Road 2237, 1.4 miles north on county road, 0.1 mile northeast on county road to oil field gate, 0.45 mile southeast on oil field road, 0.25 mile southeast on oil field road to pond, and 0.3 mile east to open flood plain of Buckners Creek.

A—0 to 6 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; very hard, firm; many fine, medium, and coarse roots; few black stains; neutral; clear smooth boundary.

C1—6 to 11 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable; many fine, medium, and coarse roots; few medium and common fine pores; neutral; gradual smooth boundary.

C2—11 to 45 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; common medium faint dark brown (10YR 4/3) and grayish brown (10YR 5/2) mottles; massive; common fine and medium roots; slightly hard, very friable; neutral; clear smooth boundary.

2Ab—45 to 58 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; common fine distinct and prominent yellowish brown (10YR 5/6) mottles; weak fine and medium subangular blocky structure; hard, friable; common fine and medium roots; few fine pores; slightly acid; clear smooth boundary.

2Bg—58 to 80 inches; light brownish gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) moist; common medium prominent yellowish brown (10YR 5/6) mottles; weak fine and medium subangular blocky structure; slightly hard, friable; few fine and medium roots; neutral.

The content of clay in the control section is less than 18 percent. Reaction ranges from slightly acid to moderately alkaline in all horizons.

The A horizon is brown, dark brown, dark grayish brown, or grayish brown. It has hue of 10YR, value of 3 to 5, and chroma of 2 or 3. The texture is clay loam.

The C horizon is brown, yellowish brown, grayish brown, or pale brown. It has hue of 10YR, value of 5 or 6, and chroma of 2 to 4. Mottles in shades of yellow,

brown, or gray range from few to common. The texture is fine sandy loam or loam and has thin strata, or horizons, of loamy fine sand, loam, clay loam, or sandy clay loam.

The 2Ab and 2Bg horizons are grayish brown and light brownish gray. They have hue of 10YR, value of 5 or 6, and chroma of 2. Mottles in shades of yellow or brown are common. The texture is fine sandy loam or loam.

Warda Series

The Warda series consists of very deep, moderately well drained, loamy soils that formed in loamy alluvial deposits. These soils are on nearly level stream terraces. Slopes are 0 to 1 percent.

Typical pedon of Warda very fine sandy loam, occasionally flooded; in La Grange, from the intersection of U.S. Highway 77 and Texas Highway 71, 11.2 miles north on U.S. Highway 77, 0.8 mile east on county road, 0.6 mile north on county road, 0.9 mile east on private road, and 0.2 mile north in pasture.

A1—0 to 8 inches; grayish brown (10YR 5/2) very fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium and coarse subangular blocky structure; very hard, friable; common fine roots; moderately acid; clear wavy boundary.

A2—8 to 15 inches; dark grayish brown (10YR 4/2) very fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium and coarse subangular blocky structure; very hard, friable; common fine roots; common fine pores; slightly acid; clear wavy boundary.

Bt1—15 to 26 inches; dark grayish brown (10YR 4/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; very hard, friable; few fine roots; few thin patchy clay films on faces of peds; strongly acid; clear wavy boundary.

Bt2—26 to 31 inches; very dark grayish brown (10YR 3/2) sandy clay loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure; very hard, friable; few fine roots; few thin patchy clay films on faces of peds; moderately acid; clear wavy boundary.

Bt3—31 to 38 inches; very dark grayish brown (10YR 3/2) sandy clay loam, very dark gray (10YR 3/1) moist; few fine distinct dark yellowish brown (10YR 4/6) mottles; moderate medium subangular blocky structure; few fine roots; few fine pores; few thin patchy clay films on faces of peds; moderately acid; clear wavy boundary.

Bt4—38 to 48 inches; dark grayish brown (10YR 4/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; hard, friable; few fine roots; few thin patchy clay films on faces of peds; slightly acid; clear wavy boundary.

Bt5—48 to 56 inches; dark grayish brown (10YR 4/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; few fine distinct dark yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; hard, friable; common fine and medium pores; few thin patchy clay films on faces of peds; slightly acid; clear wavy boundary.

BC1—56 to 64 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; slightly hard, friable; few fine and medium pores; strongly acid; gradual wavy boundary.

BC2—64 to 80 inches; brown (10YR 5/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; soft, very friable; common fine pores; strongly acid.

The thickness of the solum ranges from 60 to more than 80 inches. Content of clay in the control section ranges from 20 to 35 percent, decreasing by as much as 20 percent within a depth of 60 inches. The mollic epipedon ranges from 20 to 40 inches thick. Content of siliceous pebbles ranges from 0 to 10 percent throughout.

The A horizon is grayish brown, very dark grayish brown, very dark gray, dark grayish brown, brown, and dark gray. It has hue of 10YR, value of 3 to 5, and chroma of 1 to 3. It is less than 20 inches thick. Reaction ranges from strongly acid to slightly acid.

The upper Bt horizon is dark grayish brown, very dark grayish brown, very dark gray, dark brown, dark yellowish brown, dark gray, and brown. It has hue of 10YR, value of 3 or 4, and chroma of 1 to 4. The texture is sandy clay loam, loam, or clay loam. Reaction ranges from very strongly acid to slightly acid.

The lower Bt horizon is very dark grayish brown, very dark gray, dark grayish brown, dark brown, brown, grayish brown, brown, and yellowish brown. It has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 1 to 4. Mottles in shades of brown, red, and yellow range from few to many. The texture in the lower Bt horizon is sandy clay loam or loam. Reaction ranges from very strongly acid to neutral.

The BC horizon is dark grayish brown, brown, or grayish brown. It has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 or 3. Mottles in shades of brown range from few to many. The texture in the BC horizon is fine sandy loam or loam. Reaction ranges from very

strongly acid to neutral. In some pedons, buried layers of dark colored clay loam or clay are below a depth of 40 inches.

Weswood Series

The Weswood series consists of very deep, well drained, moderately permeable, loamy soils on flood plains of the Colorado River (fig. 27). These soils formed in calcareous, loamy alluvial materials. Slopes are 0 to 1 percent.

Typical pedon of Weswood loam, occasionally flooded; in La Grange, from the intersection of U.S. Highway 77 and Texas Highway 71, 4.0 miles west on Texas Highway 71, 0.7 mile north on county road, 0.85 mile west on county road, 2.9 miles north on county road, 0.2 mile west on private road, 0.25 mile north on private road, and 1.0 mile west in a stand of pecan trees.

A—0 to 17 inches; brown (7.5YR 5/2) loam, dark brown (7.5YR 4/2) moist; weak medium subangular blocky structure; hard, friable; many fine and medium roots; few fine pores; few snail shells; violently effervescent; moderately alkaline; clear smooth boundary.

Bw1—17 to 31 inches; brown (7.5YR 5/4) silt loam, brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; hard, firm; few fine roots; common fine pores; few snail shells; violently effervescent; moderately alkaline; gradual smooth boundary.

Bw2—31 to 42 inches; light brown (7.5YR 6/4) silt loam, brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; very hard, firm; few very fine and fine roots; few medium pores; violently effervescent; moderately alkaline; clear smooth boundary.

C—42 to 80 inches; brown (7.5YR 5/4) silt loam, brown (7.5YR 4/4) moist; massive; slightly hard, friable; few very fine roots; few thin threads of calcium carbonate on ped faces; violently effervescent; moderately alkaline.

The texture in the 10- to 40-inch control section is silt loam or silty clay loam. It averages 18 to 35 percent clay, more than 40 percent silt, and less than 15 percent fine sand or coarser sand. Weathered and discontinuous lenses and thin strata are in the Bw horizon. Reaction is moderately alkaline throughout.

The A horizon is brown, dark brown, dark reddish gray, or reddish brown. It has hue of 5YR or 7.5YR, values 4 to 6, and chroma of 2 to 4. Where the A horizon has moist values and chroma of 3.5 or less, it is less than 10 inches thick.

The Bw horizon is brown, light brown, reddish brown, or light reddish brown. It has hue of 5YR or 7.5YR, values 4 to 6, and chroma 4 to 6. The texture is silty clay loam, silt loam, or clay loam.

The C horizon is reddish brown, brown, light brown, or light reddish brown. It has hue of 5YR or 7.5YR, value of 4 to 6, and chroma of 4. The texture is stratified silt loam or silty clay loam and contains lenses and thinner strata of very fine sandy loam or fine sandy loam.

Wilson Series

The Wilson series consists of very deep, moderately well drained, loamy soils. These soils formed in alkaline clayey sediments. Slopes are 0 to 1 percent.

Typical pedon of Wilson clay loam, 0 to 1 percent slopes; in La Grange, from the intersection of U.S. Highway 77 and Texas Highway 71, 1.5 miles west on Texas Highway 71, 4 miles northwest on county road, and 300 feet southeast in cropland.

Ap—0 to 4 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium angular blocky structure parting to weak fine granular; very hard, firm; common fine and medium roots; moderately acid; abrupt wavy boundary.

A—4 to 10 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; few fine distinct dark yellowish brown mottles; weak medium angular blocky structure; very hard, firm; common fine and medium roots; few medium distinct streaks of grayish brown (10YR 5/2) material embedded in matrix; moderately acid; clear wavy boundary.

Btg1—10 to 28 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; few fine distinct dark yellowish brown (10YR 4/6) mottles; weak coarse angular blocky structure; very hard, very firm; few fine roots; few fine pores; common thin discontinuous clay films on faces of peds; few pressure faces; slightly acid; clear wavy boundary.

Btg2—28 to 51 inches; gray (10YR 5/1) silty clay, dark gray (10YR 4/1) moist; few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium angular blocky structure; very hard, very firm; few fine roots; common thin discontinuous clay films on faces of peds; few fine pebbles; slightly acid; gradual wavy boundary.

Btg3—51 to 69 inches; gray (10YR 6/1) silty clay, dark grayish brown (10YR 4/2) moist; moderate medium angular blocky structure; very hard, very firm; few

fine roots; common thin discontinuous clay films on faces of peds; few fine brown concretions; neutral; gradual wavy boundary.

BC—69 to 80 inches; light gray (2.5Y 7/2) silty clay, light brownish gray (2.5Y 6/2) moist; common fine distinct brownish yellow (10YR 6/8) mottles; neutral.

The thickness of the solum ranges from 45 to more than 60 inches. Cracks about 0.5 inch wide form to a depth of 24 inches or more during dry periods. Rounded siliceous pebbles range from 0 to 10 percent.

The A horizon is very dark gray, dark grayish brown, dark gray, or gray. It has hue of 10YR, value of 3 to 5, and chroma of 1 or 2. In some pedons, a light gray E horizon less than 1 inch thick occurs above the Btg horizon. The texture is clay loam. It is massive and hard when dry, but is soft and friable when moist. Reaction ranges from moderately acid to neutral.

The Btg1 horizon is very dark gray, dark gray, grayish brown, or black. It has hue of 10YR, value of 2 to 4, and chroma of 1. Mottles are in shades of brown or yellow. The texture is clay, silty clay, silty clay loam, or clay loam, and content of clay is 35 to 50 percent. Reaction ranges from moderately acid to slightly alkaline.

The Btg2 horizon is dark gray, dark grayish brown, grayish brown, light olive gray, or gray. It has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or less. Mottles are in shades of olive, brown, or yellow. The texture is clay, silty clay loam, or clay loam. Pressure faces range from none to common. Gypsum crystals and calcium carbonate concretions range from none to common. Reaction ranges from slightly acid to slightly alkaline.

The Btg3 horizon is gray, light gray, or grayish brown. It has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or less. Mottles are in shades of olive, brown, or yellow. The texture is clay, silty clay, or clay loam. Pressure faces range from none to common. Gypsum crystals and calcium carbonate concretions range from none to common. Reaction is neutral or slightly alkaline.

The BC horizon is light gray or light brownish gray. It has hue of 10YR or 2.5Y, value of 6 or 7, and chroma of 1 or 2. Mottles are in shades of red, brown, olive, or yellow that range from none to common. The texture is silty clay, clay, clay loam, or silty clay loam. Gypsum crystals and calcium carbonate concretions range from none to common. Reaction is neutral or slightly alkaline.

Some pedons have a C horizon that has colors mainly in shades of olive or yellow. In a few pedons, colors are in shades of red. Reaction is neutral or slightly alkaline.

Winedale Series

The Winedale series consists of moderately deep, moderately well drained, loamy soils on gently sloping uplands. They formed from tuffaceous clays overlain by gravelly loamy alluvium. Slopes range from 2 to 5 percent.

Typical pedon of Winedale gravelly fine sandy loam, 2 to 5 percent slopes; in La Grange, from the intersection of U.S. Highway 77 and Texas Highway 71, 6.9 miles north on U.S. Highway 77, 3.6 miles west on Farm Road 153, 0.5 mile north on county road and 100 feet east in woodland.

A1—0 to 4 inches; brown (10YR 4/3) gravelly fine sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable; common fine roots; 25 percent siliceous pebbles; very strongly acid; abrupt smooth boundary.

A2—4 to 7 inches; brown (10YR 5/3) gravelly fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable; common fine roots; 30 percent siliceous pebbles; very strongly acid; abrupt wavy boundary.

2Bt—7 to 14 inches; yellowish red (5YR 4/6) clay, dark reddish brown (2.5YR 3/4) moist; dusky red mottles; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; very hard, very firm; few fine and medium roots; few pressure faces; many distinct discontinuous clay films on faces of peds; extremely acid; clear wavy boundary.

2Btss—14 to 23 inches; brown (7.5YR 5/4) clay, reddish brown (5YR 4/3) moist; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; very hard, very firm; few fine roots; common thin discontinuous clay films on faces of peds; common large intersecting slickensides; many shiny pressure faces; extremely acid; clear wavy boundary.

2BCtss—23 to 37 inches; light yellowish brown (10YR 6/4) clay, brown (10YR 5/3) moist; strong medium subangular blocky structure parting to moderate medium subangular blocky; common fine distinct brownish yellow (10YR 6/8) mottles; very hard, very firm; few fine roots; few fine pores; common large intersecting slickensides; few thin discontinuous clay films on faces of peds; extremely acid; gradual wavy boundary.

2C1—37 to 51 inches; light yellowish brown (10YR 6/4) clay and soft shale that has clay texture, brown (10YR 5/3) moist; common fine distinct brownish yellow (10YR 6/8) mottles; massive; weakly bedded; very hard, very firm; few fine roots; common pressure faces; 40 percent weakly

consolidated shale fragments; extremely acid; gradual wavy boundary.

2C2—51 to 62 inches; very pale brown (10YR 7/3) clay and shale that has clay texture, yellowish brown (10YR 5/4) moist; common medium distinct brownish yellowish (10YR 6/8) mottles; massive; weakly bedded; very hard, very firm; few very fine roots; few pressure faces; 40 percent weakly consolidated shale fragments; extremely acid; gradual wavy boundary.

2C3—62 to 80 inches; very pale brown (10YR 7/3) shale that has clay texture, yellowish brown (10YR 5/4) moist; weakly bedded; very hard, very firm; 40 percent weakly consolidated shale fragments; extremely acid.

The thickness of the solum ranges from 20 to 40 inches. Base saturation ranges from 35 to 75 percent throughout the argillic horizon. Content of clay in the control section ranges from 60 to 70 percent and COLE values range from 0.07 to more than 0.09 in the Bt horizon. Intersecting slickensides range from few to common below a depth of 12 inches. When dry, cracks 0.5 inch wide are in the argillic horizon and extend to a depth of 20 inches or more.

The A horizon is brown, dark brown, dark yellowish brown, dark grayish brown, grayish brown, and yellowish brown. It has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The texture is gravelly fine sandy loam. Siliceous pebbles range from 15 to 35 percent. The A horizon is less than 10 inches thick. Reaction ranges from very strongly acid to slightly acid.

Some pedons have a thin discontinuous E horizon that has value and chroma 1 to 2 units higher than the A horizon.

The 2Bt horizon is brown, light reddish brown, dark reddish brown, reddish brown, reddish gray, dark red, yellowish red, or reddish yellow. It has hue of 2.5YR to 7.5YR, value of 3 to 6, and chroma of 2 to 8. Mottles in shades of brown, gray, or yellow range from none to few. The texture is clay. Content of clay ranges from 60 to 70 percent. Reaction ranges from extremely acid to strongly acid.

The 2BCtss horizon is brown, light yellowish brown, pale brown, or very pale brown. It has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 3 or 4. Mottles in shades of brown, gray, red, or yellow range from none to common. The texture is clay. Content of clay ranges from 60 to 70 percent. Reaction ranges from extremely acid to strongly acid. Some pedons have a 2BCt horizon that has color, texture, and reaction similar to the 2BCtss horizon.

The 2C horizon is brown, pale brown, light yellowish brown, yellowish brown, or very pale brown. It has hue of 10YR, value of 5 to 7, and chroma of 3 or 4. Mottles in shades of brown, gray, or yellow range from none to common. Weakly consolidated fragments of shale range from 15 to 50 percent.

Zack Series

The Zack series consists of moderately deep, moderately well drained, loamy soils on dissected uplands. These soils formed in alkaline clayey and loamy sediments. Slopes range from 1 to 5 percent.

Typical pedon of Zack very fine sandy loam, 1 to 3 percent slopes; in West Point, from the intersection of Farm Road 154 and Loop 543, 2.6 miles south on Farm Road 154, 3.2 miles west on county road, 0.6 mile south on county road, 1.7 miles west on county road, and 180 feet south in rangeland.

A—0 to 6 inches; grayish brown (10YR 5/2) very fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; very soft, very friable; many very fine and fine roots; 2 percent siliceous pebbles; slightly acid; abrupt wavy boundary.

Bt1—6 to 14 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; common fine and medium prominent yellowish red (5YR 5/8) mottles; weak medium subangular blocky structure; very hard, very firm; many very fine and fine roots; few patchy clay films on faces of peds; slightly acid; gradual wavy boundary.

Bt2—14 to 24 inches; reddish brown (5YR 4/4) clay, reddish brown (5YR 4/4) moist; few fine prominent pale brown (10YR 6/3) mottles; weak medium subangular blocky structure; very hard, firm; many fine roots; few thin patchy clay films on faces of peds; few fine concretions of calcium carbonate; neutral; gradual wavy boundary.

Bt3—24 to 34 inches; yellowish brown (5YR 5/4) clay, reddish brown(5YR 4/4) moist; weak medium subangular blocky structure; very hard, firm; few thin patchy clay films on faces of peds; few fine concretions of calcium carbonate; neutral; gradual wavy boundary.

2BC—34 to 38 inches; mottled very pale brown (10YR 7/3) and brownish yellow (10YR 6/6) sandy clay loam; few fine and medium distinct strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; slightly hard, friable; common threads of white salts on faces of peds; neutral; gradual wavy boundary.

2C—38 to 72 inches; light gray (2.5Y 7/2) loam, light brownish gray (2.5Y 6/2) moist; common medium distinct yellow (2.5Y 8/6) and brownish yellow (10YR 6/8) mottles; massive; soft, very friable; few fine fragments of sandstone; neutral.

The thickness of the solum ranges from 25 to 40 inches, which is the depth to stratified clayey or loamy deltaic sediments. The boundary between the A and Bt horizons is abrupt.

The A horizon is dark brown, grayish brown, dark grayish brown, or brown. It has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is very fine sandy loam and gravelly fine sandy loam. Siliceous pebbles range from 0 to 35 percent. Reaction ranges from strongly acid to slightly acid.

The Bt1 horizon is brown, dark brown, yellowish brown, or reddish brown. It has hue of 5YR to 10YR, value of 4 to 5, and chroma of 3 or 4. Mottles in shades of brown or red range from none to common. The texture is clay. Content of clay ranges from 40 to 55 percent. Reaction ranges from moderately acid to neutral.

The Bt2 horizon is dark brown, grayish brown, brown, reddish brown, or yellowish brown. It has hue of 5YR to 10YR, value of 4 or 5, and chroma of 2 to 4. The texture is clay or sandy clay. Content of clay ranges from 35 to 55 percent. Reaction ranges from moderately acid to slightly alkaline.

The Bt3 horizon is brown, grayish brown, dark grayish brown, reddish brown, yellowish brown, or yellowish red. It has hue of 5YR to 10YR, value of 4 or 5, and chroma of 2 to 6. Mottles in shades of gray range from few to common. The texture is clay or clay loam. Calcium carbonate concretions range from none to common. Threads of salt range from none to few. Reaction ranges from neutral to slightly alkaline.

The 2BC horizon is yellowish brown, brownish yellow, light brownish gray, light gray, or light olive brown. It has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 2 to 6. The texture is sandy clay loam, clay loam, or silty clay loam. Calcium carbonate concretions range from none to few. Reaction ranges from neutral to moderately alkaline. The matrix can be calcareous or noncalcareous.

The 2C horizon is light gray, light brownish gray, or grayish brown. It has hue of 2.5Y, value of 5 to 7, and chroma of 2. Mottles in shades of brown or yellow range from none to few. The 2C horizon is weakly consolidated deltaic sediments that have texture of clay loam, loam, or silty clay loam. Reaction ranges from neutral to moderately alkaline. The matrix can be calcareous or noncalcareous. Exchangeable sodium ranges from 6 to 12 percent and electrical conductivity ranges from 1 to 5 mmhos/cm.

Zulch Series

The Zulch series consists of moderately deep, moderately well drained, loamy soils on uplands. These soils formed in alkaline clayey and loamy deltaic sediments. Slopes range from 0 to 2 percent.

Typical pedon of Zulch fine sandy loam, 0 to 2 percent slopes; in West Point, from the intersection of Farm Road 154 and Loop 543, 2.8 miles south on Farm Road 154 to county road, 6.5 miles west on county road to oil field road, 0.5 mile south on oil field road to oil well site, and 75 feet southeast of well site in rangeland.

A—0 to 5 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; few fine distinct yellowish brown mottles; weak fine subangular blocky structure; massive when dry; very hard, friable; common fine and medium roots; few fine pores; slightly acid; abrupt wavy boundary.

Bt1—5 to 28 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate medium prismatic structure parting to moderate fine and medium angular blocky; extremely hard, very firm; few fine roots; common shiny pressure faces; light gray (10YR 7/2) loamy material on faces of prisms; neutral; gradual wavy boundary.

Bt2—28 to 39 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate coarse prismatic structure parting to moderate fine and medium angular blocky; extremely hard, very firm; few fine roots; common shiny ped faces; light gray (10YR 7/2) loamy material on faces of prisms; slightly alkaline; clear wavy boundary.

CB—39 to 48 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; common medium distinct dark gray (10YR 4/1) mottles; moderate fine prismatic structure parting to weak fine and medium angular blocky; very hard, firm; few fine roots; few fine masses of calcium carbonate; strongly effervescent; slightly alkaline; clear wavy boundary.

C—48 to 58 inches; light brownish gray (2.5Y 6/2) weakly consolidated siltstone interbedded with thin strata of brownish yellow (10YR 6/8) and light gray (10YR 7/2) weakly cemented sandy and loamy material; massive; extremely hard, firm; few fine roots; few black concretions; few thin strong brown (7.5YR 5/6) and yellow (5Y 8/6) iron-enriched strata; neutral.

The thickness of the solum ranges from 30 to 40 inches, which corresponds to the depth to underlying siltstone and shale strata. The soil has a potential linear extensibility of 6 centimeters or more. When dry, cracks extend to a depth of 40 inches or more. Salts

and carbonate concretions range from none to common at the contact with C materials.

The A horizon is dark gray, grayish brown, or dark grayish brown. It has hue of 10YR, value of 4 or 5, and chroma of 1 or 2. The texture is fine sandy loam. Reaction is slightly acid or neutral. The thickness of the A horizon averages less than 10 inches.

The Bt1 horizon is very dark gray, very dark grayish brown, or dark grayish brown. It has hue of 10YR, value of 3, and chroma of 1 or 2. Yellowish brown mottles range from none to common. The texture is clay loam or clay. Reaction ranges from slightly acid to slightly alkaline.

The Bt2 horizon is very dark gray, dark gray, dark grayish brown, grayish brown, or gray. It has hue of 10YR, value of 3 to 5, and chroma of 1 or 2. Yellowish brown or strong brown mottles range from none to common. The texture is clay loam or clay. Reaction ranges from slightly acid to slightly alkaline.

The CB horizon is grayish brown or light brownish gray. It has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2. Mottles in shades of gray, brown, or yellow range from few to common. The texture is clay loam or clay. Concretions of calcium carbonate range from none to few. Reaction is slightly alkaline or moderately alkaline.

The C horizon is stratified weakly consolidated siltstone or shale that has texture of clay loam or clay. It contains strata of weakly cemented sandy and loamy materials. The stratified material is light brownish gray, light gray, very pale brown, or pale brown. The C horizon has hue of 10YR or 2.5Y, value of 6 or 7, and chroma of 2 or 3. Some strata contain few or common mottles in shades of brown, yellow, or gray. Reaction ranges from neutral to moderately alkaline.

Formation of the Soils

This section describes the factors of soil formation and relates them to the formation of soils in Fayette County. It also explains the process of soil horizon development.

Factors of Soil Formation

Soil is the product of the interaction of five major factors of soil formation: climate, organisms, topography, time, and parent material. If a factor, such as climate or vegetation changes, a different kind of soil forms.

Climate

The climate of Fayette County is warm and humid. Rainfall, evaporation, and temperature are the main influences over climatic conditions. The rainfall rate generally is lower in the western part of the county and higher in the eastern part. The different rainfall rates influence the physical features and chemical properties of the soils from west to east. The soils in the western part of Fayette County are typically drier than the soils in the eastern part. Because of the climatic changes, the natural vegetation changes from west to east throughout the county. In many areas, the effects of rainfall are modified locally by relief.

Living Organisms

Plants, insects, animals, bacteria, and fungi, as well as the human factor, influence the formation of soils. The organic matter content, nitrogen content, plant nutrients, soil structure, and porosity are some of the parameters affected by living organisms.

Vegetation is probably the major living organism that has affected soil formation in Fayette County. Soils in the northwestern part of the county tend to be more acid because of the influence of pine forests. Soils under timber vegetation generally are low in organic matter. Many of the soils on upland prairies are high in organic matter.

Topography

Topography, or relief, affects soil formation by influencing drainage, erosion, plant cover, and soil temperature. The soils in Fayette County range from nearly level to steep, but most of the county is gently sloping.

Time

A long period of time is required to influence the soil formation process and the development of distinct soil horizons. Fayette County has soils that range from young to old. The youngest soils occur along the Colorado River, and they display very little evidence of horizon development. Most of these soils are very stratified throughout, with little or no evidence of clay accumulation in the subsoil. Gad and Coarsewood soils are young soils associated with the Colorado River, and these soils have little or no evidence of horizon development.

The soils of intermediate age occur on fluviatile terraces above flood plains in the county. These soils have distinct horizon development and are not leached of their bases as are some older soils. Smithville and Gholson soils are of intermediate age. These soils have distinct horizon development and have appreciable amounts of clay accumulation in the subsoil.

Older soils occur on gently sloping to steep uplands in Fayette County. These soils have distinct horizon development and have been leached of some bases. Burlewash and Hallettsville soils are older. These soils have distinct surface and subsoil horizons that have little or no resemblance to the parent material. These soils have very high clay accumulation in the subsoil and pH ranges from acid to alkaline throughout the soil profile.

Parent Material

Parent material is the bedrock mass from which soil is formed. It determines the limits of chemical and mineral composition of soil. Fayette County soils have formed in parent materials of two geologic systems, the Tertiary and Quaternary systems *(10, 11)*. Tertiary formations strike across the county in a northeast-southwest direction and dip gently southeastward. Quaternary alluvial deposits are associated with many larger streams in the county and the Colorado River.

Geology

Ed Garner, Bureau of Economic Geology, University of Texas, prepared this section

Tertiary

Tertiary bedrock materials include sandstones, sands, and clays of the Fleming, Oakville, Catahoula, Whitsett, Manning, Wellborn, Caddell, Yegua, Cook Mountain, Sparta, and Weches Formations. The Fleming, Oakville, and Catahoula Formations were deposited during Miocene time, 11 to 25 million years ago. The Whitsett Formation was deposited during early Oligocene and late Eocene time, 25 to 40 million years ago. The Manning, Wellborn, Caddell, Yegua, Cook Mountain, Sparta, and Weches Formations were laid down 40 to 60 million years ago during Eocene time.

The Weches Formation is composed of greensand, sand, and clay. The greensand is mostly pale green to yellowish brown glauconite with locally common quartz sand. The sands are interbedded with dark brown to chocolate brown silty glauconitic clay containing abundant marine megafossil fragments. Total thickness of the Weches Formation is about 40 feet. The major soil formed in areas of the Weches Formation is the Padina soil.

The Sparta Sand is of light gray to yellow-brown, very fine to fine quartz sand with some silty clay partings. Thin carbonaceous to lignitic beds are near the top of the formation. The sands are unconsolidated near the top to moderately indurated near the base. Total thickness is about 150 feet. The major soil formed in areas of the Sparta Formation is the Padina soil.

The Cook Mountain Formation is mostly brown to brown-gray gypsiferous clays that are slightly silty, lignitic, and contain minor amounts of glauconite. Minor amounts of gray to brown very fine, glauconitic sand are locally present in the formation. The Cook Mountain Formation is about 225 feet thick. Major soils formed in areas of the Cook Mountain Formation are the Crockett, Luling, and Normangee soils.

The Yegua Formation is mostly sand, clay, and lignite. The fine grained quartz sands are locally calcareous and glauconitic, and range from massive to laminated and cross-bedded. The chocolate brown clays are lignitic, sandy, and bentonitic and contain petrified wood. Lentils of lignite are common in many areas. The thickness of the Yegua Formation is about 1,000 feet. Major soils formed in areas of the Yegua Formation are the Gredge, Chazos, and Zack soils.

The Caddell, Wellborn, Manning, and Whitsett Formations are in the Jackson Group and include varying amounts of volcanic ash or tuffaceous sediments.

The Caddell Formation is mainly lignitic, bentonitic, and locally fossiliferous clays; fine to medium grained glauconitic and calcareous sandstones; and tuffaceous siltstones. Total thickness is about 75 feet. Major soils formed in areas of the Caddell Formation are the Burlewash, Cadell, and Winedale soils.

The Wellborn Formation is composed mostly of lenticular, fine to medium tuffaceous quartz sandstones that are indurated and locally cemented by silica. Clays are tuffaceous and lignitic and are interbedded with sand. Thickness of the formation is about 150 feet. Major soils formed in areas of the Wellborn Formation are the Burlewash, Koether, and Shalba soils.

The Manning Formation is mostly clay, sandstone, and bentonite. Clays are commonly chocolate brown and lignitic with abundant petrified wood. Clays are interbedded with fine to medium grained tuffaceous sandstone. A light yellow to white, indurated, waxy bentonite (plum bentonite) is at the base of the Manning Formation in Fayette County. Major soils formed in areas of the Manning Formation are the Arol, Singleton, Shalba, and Rutersville soils.

The Whitsett Formation is dominantly light gray to white, fine to medium grained tuffaceous sand with abundant petrified wood in this area. Thickness is about 150 feet. Major soils formed in areas of the Whitsett Formation are the Arol, Singleton, Shalba, and Rutersville soils.

The Catahoula Formation is mostly gray bentonitic clay and fine to medium grained tuffaceous sandstones. It is about 200 feet thick. Major soils formed in areas of the Catahoula Formation are the Greenvine and Flatonia soils *(3)*.

The Oakville Sandstone is mainly gray, medium grain, calcareous, cross-bedded, quartz sandstone with reworked Cretaceous fossils. Gray calcareous clays are locally present. Thickness is about 500 feet. A typical area of exposed Oakville Sandstone is located at the “Bluff” as vertical escarpments along the Colorado River south of La Grange. Major soils formed in areas of the Oakville Sandstone are the Frelsburg and Carbengle soils.

The Fleming Formation is mostly gray calcareous clay with locally abundant medium to coarse grained calcareous sands. The Fleming Formation also contains reworked Cretaceous fossils. Thickness is about 1,200 feet. Major soils formed in areas of the Fleming Formation are the Frelsburg, Carbengle, and Hallettsville soils.

Quaternary System

Pleistocene and Holocene alluvial sands, gravels, and clays, generally less than 1 million years old, comprise the Quaternary System in Fayette County. Pleistocene age sediments include the Willis Formation and fluvial deposition under terraces. Holocene alluvium is within the flood plains of the major streams.

Scattered Willis Formation outcrops mantle gravelly hilltops and ridges along the Colorado River, and underlie large areas of gravelly soils in the northern half of the county. The gravels are composed primarily of siliceous materials. A typical area of gravel deposits is located in the Rek Hill community. Major soils formed in areas of the Willis Formation are the gravelly Straber, Carmine, and Rek soils. A few Willis Formation outcrops are large sandy areas. The Joiner, Tremona, and nongravelly Straber soils are predominate in the sandy areas.

Fluvial terraces include terraces along the Colorado River and smaller streams and high terraces located along the divide between the Colorado and Brazos River basins in the vicinity of Ledbetter. The composition of high terrace deposits in the northern part of the county is similar to that of the Willis Formation. Soils formed in areas of these gravel fluvial sediments are similar to those on the Willis Formation and include the gravelly Straber, Carmine, and Rek soils.

Pleistocene fluvial deposits and Holocene alluvium are composed of sand, silt, clay, and gravel which overlap bedrock along the Colorado River and smaller streams. Major soils formed in areas of the fluvial deposits are Wilson, Branyon, Ships, Gholson, Smithville, and Dutek soils. Major soils formed in areas of Holocene age alluvial deposits of the Colorado River are Gad, Bergstrom, and Coarsewood soils. Major soils formed in areas of Holocene age alluvium deposits along smaller streams are Ganado, Pursley, and Degola soils

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds directly beneath the solum, or it is exposed at the surface by erosion.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Compressible. Excessive decrease in volume of soft soil under load.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the “Soil Survey Manual.”

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the “Soil Survey Manual.”

Drainage, surface. Runoff, or surface flow of water, from an area.

Ecological site. An area of rangeland where climate, soil, and r elief are sufficiently uniform to produce

a distinct natural plant community. An ecological site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other ecological sites in kind or proportion of species or total production.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation and eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Fine textured soil. Sandy clay, silty clay, or clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Footslope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai. Commonly, a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of clayey soils that shrink and swell considerably with changes in moisture content.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the “Soil Survey Manual.” The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called “a soil.” A pedon is three-dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as “saturated hydraulic conductivity,” which is defined in the “Soil Survey Manual.” In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as “permeability.” Terms describing permeability, measured in inches per hour, are as follows:

Extremely slow	0.0 to 0.01 inch
Very slow	0.01 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth’s surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

Root zone. The part of the soil that can be penetrated by plant roots

Rooting depth (in tables). Shallow root zone. The soil is shallow over a loyer that greatly restricts roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a

soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Seguum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by induration of a clay, silty clay, or silty clay loam deposit and having the tendency to split into thin layers.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, classes for simple slopes are as follows:

Nearly level	0 to 1 percent
Very gently sloping	1 to 3 percent
Gently sloping	3 to 5 percent
Moderately sloping	5 to 8 percent
Strongly sloping	8 to 12 percent
Moderately steep	12 to 20 percent
Steep	20 to 45 percent
Very steep	45 percent and higher

Classes for complex slopes are as follows:

Nearly level	0 to 1 percent
Gently undulating	1 to 5 percent
Undulating	1 to 8 percent
Rolling	5 to 10 percent
Strongly rolling	5 to 16 percent
Hilly	10 to 30 percent
Steep	20 to 45 percent
Very steep	45 percent and higher

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and

sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Toxicity. Excessive amount of toxic substances, such as sodium or sulfur, that severly hinder establishment of vegetation or severely restrict plant growth.

Trace elements. Chemical elements, for example, zine, cobalt, maganese, copper, and iron, in soils

in extremely small amounts. They are essential to plant growth.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

Table 1.--Temperature and Precipitation

(Recorded in the period 1951-88 at Flatonia, Texas)

Month	Temperature					Precipitation					
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree dayS-	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with Average 0.10 inch or more	Average Snowfall
	°F	°F	°F	°F	°F	Units	In	In	In	In	In
January--	61.8	40.6	51.2	81	16	170	2.16	0.57	3.38	5	0.2
February-	66.0	43.9	55.0	85	21	190	2.71	1.11	3.88	5	0.1
March----	73.5	50.7	62.1	90	27	385	1.85	0.55	2.77	4	0.0
April----	80.2	58.8	69.5	92	37	585	3.42	0.77	5.42	4	0.0
May------	85.4	64.8	75.1	95	49	778	4.61	1.64	6.92	6	0.0
June-----	91.3	70.2	80.8	100	58	924	4.28	1.05	6.42	5	0.0
July-----	95.1	72.5	83.8	103	65	1,048	1.81	0.36	2.84	3	0.0
August---	95.7	72.3	84.0	104	65	1,054	2.46	0.31	4.08	3	0.0
September	90.0	68.0	79.0	100	51	870	5.05	1.70	7.58	5	0.0
October--	82.3	59.4	70.9	94	40	648	3.53	0.59	5.68	4	0.0
November-	72.1	50.3	61.2	87	28	347	2.88	0.69	4.45	4	0.0
December-	64.6	43.2	53.9	83	21	191	2.56	0.89	3.71	5	0.0
Yearly:											
Average-	79.8	57.9	68.9	---	---	---	---	---	---	---	---
Extreme-	---	---	---	104	14	---	---	---	---	---	---
Total---	---	---	---	---	---	7,190	37.32	28.18	47.19	53	0.3

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1951-88 at Flatonia, Texas)

Probability	Temperature 24°F or lower	28°F or lower	32°F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	February 24	March 14	April 4
2 years in 10 later than--	February 17	March 4	March 25
5 years in 10 later than--	February 1	February 13	March 4
First freezing temperature in fall:			
1 year in 10 earlier than--	December 1	November 15	November 8
2 years in 10 earlier than--	December 11	November 26	November 17
5 years in 10 earlier than--	January 2	December 16	December 3

Table 3.--Growing Season

(Recorded in the period 1951-88 at Flatonia, Texas)

Probability	Daily minimum temperature during growing season: Higher than 24°F	Higher than 28°F	Higher than 32°F
	Days	Days	Days
9 years in 10	296	257	230
8 years in 10	307	273	245
5 years in 10	333	304	273
2 years in 10	365	340	301
1 year in 10	365	365	316

Table 4.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
ArA	Arol fine sandy loam, 0 to 2 percent slopes	15,575	2.5
Bg	Bergstrom silt loam, rarely flooded	5,737	0.9
BkB	Bleiblerville clay, 1 to 3 percent slopes	8,326	1.4
Bo	Bosque sandy clay loam, occasionally flooded	2,000	0.3
BrA	Branyon clay, 0 to 1 percent slopes	4,201	0.7
BsD	Brenham clay loam, 3 to 8 percent slopes	5,737	0.9
BuA	Burleson clay, 0 to 1 percent slopes	1,488	0.2
BwC	Burlewash fine sandy loam, 2 to 5 percent slopes	8,962	1.5
BwE	Burlewash very gravelly fine sandy loam, 5 to 20 percent slopes	9,987	1.6
BwF	Burlewash very gravelly fine sandy loam, 20 to 45 percent slopes	1,411	0.2
CaB	Cadell very fine sandy loam, 1 to 3 percent slopes	11,070	1.8
CbC	Carbengle sandy clay loam, 3 to 5 percent slopes	30,936	5.0
CbD	Carbengle sandy clay loam, 5 to 8 percent slopes	9,147	1.5
CbE4	Carbengle-Gullied land complex, 5 to 12 percent slopes	1,628	0.3
CeC	Carmine extremely gravelly very fine sandy loam, 2 to 5 percent slopes	5,349	0.9
ChB	Chazos loamy fine sand, 1 to 3 percent slopes	15,977	2.6
Co	Coarsewood silt loam, occasionally flooded	4,608	0.8
CrB	Crockett loam, 1 to 3 percent slopes	7,906	1.3
Dg	Degola loam, occasionally flooded	2,450	0.4
DnC	Dubina loamy fine sand, 2 to 5 percent slopes	10,257	1.7
DtB	Dutek loamy fine sand, 1 to 3 percent slopes	3,178	0.5
EdD2	Edge gravelly fine sandy loam, 5 to 12 percent slopes, eroded	8,342	1.4
EfB	Elmendorf-Denhawken complex, 1 to 3 percent slopes	3,411	0.6
FaB	Flatonia loam, 1 to 3 percent slopes	9,534	1.6
FrB	Frelsburg clay, 1 to 3 percent slopes	41,101	6.7
FrC	Frelsburg clay, 3 to 5 percent slopes	23,344	3.8
FrD	Frelsburg clay, 5 to 8 percent slopes	4,896	0.8
Ga	Gad loamy fine sand, rarely flooded	884	0.1
Gb	Gad loamy fine sand, occasionally flooded	3,808	0.6
Gd	Gad fine sand, frequently flooded	1,855	0.3
Ge	Ganado clay, occasionally flooded	3,669	0.6
Gf	Ganado clay, frequently flooded	3,008	0.5
GhA	Gholson very fine sandy loam, 0 to 1 percent slopes	1,101	0.2
GhB	Gholson very fine sandy loam, 1 to 3 percent slopes	3,520	0.6
GrB	Gredge fine sandy loam, 1 to 3 percent slopes	23,722	3.9
GvB	Greenvine clay, 1 to 3 percent slopes	6,264	1.0
GvC	Greenvine clay, 3 to 5 percent slopes	3,830	0.6
GvD4	Greenvine-Gullied land complex, 3 to 8 percent slopes	977	0.2
HvB	Hallettsville fine sandy loam, 1 to 3 percent slopes	37,717	6.1
IzA	Inez fine sandy loam, 0 to 1 percent slopes	4,589	0.7
JoC	Joiner sand, 2 to 5 percent slopes	1,225	0.2
KnC	Knolle fine sand, 2 to 5 percent slopes	2,822	0.5
KoC	Koether loamy fine sand, 2 to 5 percent slopes, stony	899	0.1
Kr	Krum silty clay, rarely flooded	3,194	0.5
KuC	Kurten very fine sandy loam, 2 to 5 percent slopes	2,667	0.4
LaD	Latium clay, 3 to 8 percent slopes	8,542	1.4
LaD3	Latium clay, 5 to 15 percent slopes, severely eroded	9,035	1.5
LgD	Latium gravelly clay, 5 to 12 percent slopes	4,899	0.8
LkA	Lufkin fine sandy loam, 0 to 2 percent slopes	6,904	1.1
LuC	Luling clay, 3 to 5 percent slopes	2,140	0.3
Na	Navidad fine sandy loam, rarely flooded	2,310	0.4
Nd	Navidad fine sandy loam, occasionally flooded	1,566	0.3
NmC	Normangee clay loam, 2 to 5 percent slopes	4,217	0.7
PaC	Padina fine sand, 2 to 5 percent slopes	1,240	0.2
PD	Pits and Dumps, saline	822	0.1
PS	Pits and Dumps, sandy	1,628	0.3
Pu	Pursley clay loam, frequently flooded	14,047	2.3
RbC	Rabbs clay loam, 5 to 8 percent slopes	1,969	0.3
RhB	Rehburg loamy fine sand, 1 to 3 percent slopes	1,550	0.3
RkC	Rek extremely gravelly coarse sandy loam, 2 to 5 percent slopes	4,605	0.7
RnC	Renish-Rock outcrop complex, 2 to 8 percent slopes	4,775	0.8
RnE	Renish-Rock outcrop complex, 8 to 20 percent slopes, very stony	558	0.1
RoB	Robco fine sand, 1 to 3 percent slopes	2,124	0.3
RrB	Robco loamy fine sand, 1 to 3 percent slopes	946	0.2

Table 4.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
Rt	Roetex clay, frequently flooded	946	0.2
RvA	Rutersville loamy fine sand, 0 to 2 percent slopes	13,036	2.1
ScC	Schulenburg sandy clay loam, 3 to 8 percent slopes	3,333	0.5
ShC	Shalba fine sandy loam, 2 to 5 percent slopes	1,395	0.2
ShC2	Shalba fine sandy loam, 2 to 5 percent slopes, eroded	4,016	0.7
ShD4	Shalba-Gullied land complex, 3 to 8 percent slopes	2,853	0.5
Sp	Ships clay, occasionally flooded	4,109	0.7
SrB	Shiro loamy fine sand, 1 to 3 percent slopes	8,732	1.4
StB	Singleton fine sandy loam, 1 to 3 percent slopes	28,551	4.7
SvA	Smithville fine sandy loam, 0 to 1 percent slopes	3,659	0.6
SwC	Straber loamy fine sand, 2 to 5 percent slopes	26,666	4.3
SxC	Straber gravelly loamy fine sand, 2 to 5 percent slopes	17,458	2.8
SxD	Straber gravelly loamy fine sand, 5 to 8 percent slopes	2,713	0.4
TrB	Tremona loamy sand, 1 to 3 percent slopes	2,589	0.4
Tw	Trinity clay, occasionally flooded	2,093	0.3
Uf	Uhland clay loam, frequently flooded	16,496	2.7
US	Ustorthents, sandy	419	0.1
Wa	Warda very fine sandy loam, occasionally flooded	2,884	0.5
We	Weswood loam, occasionally flooded	4,025	0.7
WsA	Wilson clay loam, 0 to 1 percent slopes	8,782	1.4
WwC	Winedale gravelly fine sandy loam, 2 to 5 percent slopes	4,524	0.7
ZkB	Zack very fine sandy loam, 1 to 3 percent slopes	6,760	1.1
ZkC	Zack gravelly fine sandy loam, 2 to 5 percent slopes	2,062	0.3
ZuA	Zulch fine sandy loam, 0 to 2 percent slopes	5,147	0.8
	Water acres greater than 40 acres	3,696	0.6
	Water 2 to 39 acres in size	970	0.2
	Total	614,100	100.0

Table 5.--Prime Farmland

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name.)

Map symbol	Soil name
Bg	Bergstrom silt loam, rarely flooded
BkB	Bleiblerville clay, 1 to 3 percent slopes
Bo	Bosque sandy clay loam, occasionally flooded
BrA	Branyon clay, 0 to 1 percent slopes
BuA	Burleson clay, 0 to 1 percent slopes
CbC	Carbengle sandy clay loam, 3 to 5 percent slopes
Co	Coarsewood silt loam, occasionally flooded
Dg	Degola loam, occasionally flooded
EfB	Elmendorf-Denhawken Complex, 1 to 3 percent slopes
FaB	Flatonia loam, 1 to 3 percent slopes
FrB	Frelsburg clay, 1 to 3 percent slopes
FrC	Frelsburg clay, 3 to 5 percent slopes
Ge	Ganado clay, occasionally flooded
GhA	Gholson very fine sandy loam, 0 to 1 percent slopes
GhB	Gholson very fine sandy loam, 1 to 3 percent slopes
GvB	Greenvine clay, 1 to 3 percent slopes
GvC	Greenvine clay, 3 to 5 percent slopes
HvB	Hallettsville fine sandy loam, 1 to 3 percent slopes
KnC	Knolle fine sand, 2 to 5 percent slopes
Kr	Krum silty clay, rarely flooded
LuC	Luling clay, 3 to 5 percent slopes
Na	Navidad fine sandy loam, rarely flooded
Nd	Navidad fine sandy loam, occasionally flooded
Sp	Ships clay, occasionally flooded
SvA	Smithville fine sandy loam, 0 to 1 percent slopes
Tw	Trinity clay, occasionally flooded
Wa	Warda very fine sandy loam, occasionally flooded
We	Weswood loam, occasionally flooded

Table 6.--Land Capability and Yields Per Acre of Crops and Pasture

(Yields in the N columns are for nonirrigated soils; those in the I columns are for irrigated soils. Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil.)

Soil name and map symbol	Land capability		Grain sorghum		Wheat		Corn		Cotton		Improved bermudagrass		Common bermudagrass	
	N	I	N	I	N	I	N	I	N	I	N	I	N	I
			Bu	Bu	Bu	Bu	Bu	Bu	Lbs	Lbs	AUM*	AUM*	AUM*	AUM*
ArA----------------- Arol	3w	---	45	---	---	---	35	---	250	---	5.0	---	4.0	---
Bg------------------ Bergstrom	1	---	105	---	---	---	100	---	500	---	6.0	---	5.0	---
BkB----------------- Bleiblerville	2e	---	75	---	---	---	60	---	400	---	7.0	---	6.0	---
Bo------------------ Bosque	2w	---	65	---	45	---	70	---	450	---	7.0	---	4.0	---
BrA----------------- Branyon	2w	---	100	---	45	---	80	---	550	---	6.0	---	5.0	---
BsD----------------- Brenham	4e	---	60	---	---	---	---	---	---	---	5.0	---	4.0	---
BuA----------------- Burleson	2w	---	85	---	40	---	80	---	450	---	7.0	---	5.0	---
BwC----------------- Burlewash	4e	---	---	---	---	---	---	---	---	---	6.0	---	4.0	---
BwE----------------- Burlewash	6e	---	---	---	---	---	---	---	---	---	3.0	---	2.0	---
BwF---------------- Burlewash	7e	---	---	---	---	---	---	---	---	---	---	---	---	---
CaB----------------- Cadell	3e	---	---	---	---	---	---	---	---	---	5.5	---	4.5	---
CbC----------------- Carbengle	3e	---	---	---	---	---	60	---	---	---	5.0	---	3.0	---
CbD----------------- Carbengle	4e	---	---	---	---	---	---	---	---	---	4.0	---	3.0	---
CbE4---------------- Carbengle-Gullied land	6e	---	---	---	---	---	---	---	---	---	3.0	---	2.0	---
CeC----------------- Carmine	4s	---	---	---	---	---	---	---	---	---	3.0	---	2.0	---
ChB----------------- Chazos	2e	---	40	---	20	---	40	---	---	---	6.0	---	5.0	---
Co------------------ Coarsewood	2w	---	90	110	---	---	95	125	800	1,400	7.0	---	5.0	---

Table 6.--Land Capability and Yields Per Acre of Crops and Pasture--Continued

Soil name and map symbol	Land capability		Grain sorghum		Wheat		Corn		Cotton		Improved bermudagrass		Common bermudagrass	
	N	I	N	I	N	I	N	I	N	I	N	I	N	I
			Bu	Bu	Bu	Bu	Bu	Bu	Lbs	Lbs	AUM*	AUM*	AUM*	AUM*
CrB----------------- Crockett	3e	---	55	---	35	---	40	---	300	---	6.0	---	4.0	---
Dg------------------ Degola	2w	---	70	---	---	---	70	---	500	---	7.0	---	5.0	---
DnC----------------- Dubina	3e	---	55	---	---	---	55	---	---	---	6.0	---	5.0	---
DtB----------------- Dutek	3s	---	40	---	---	---	---	---	---	---	7.0	---	5.0	---
EdD2---------------- Edge	6e	---	---	---	---	---	---	---	---	---	4.0	---	---	---
EfB----------------- Elmendorf	2e	---	65	125	30	---	50	115	352	804	3.0	---	2.0	---
EfB----------------- Denhawken	3e	---	40	100	25	---	30	90	300	700	3.0	---	2.0	---
FaB----------------- Flatonia	2e	---	60	---	---	---	60	---	---	---	7.0	---	5.0	---
FrB----------------- Frelsburg	2e	---	70	---	---	---	80	---	400	---	7.0	---	5.0	---
FrC----------------- Frelsburg	3e	---	55	---	---	---	60	---	350	---	7.0	---	5.0	---
FrD----------------- Frelsburg	4e	---	30	---	---	---	30	---	---	---	5.0	---	3.0	---
Ga------------------ Gad	3s	---	30	---	15	---	---	---	---	---	5.0	---	3.0	---
Gb------------------ Gad	4s	---	30	---	15	---	---	---	---	---	4.0	---	3.0	---
Gd------------------ Gad	5w	---	---	---	---	---	---	---	---	---	4.0	---	3.0	---
Ge------------------ Ganado	2w	---	---	---	---	---	---	---	---	---	7.0	---	5.0	---
Gf------------------ Ganado	5w	---	---	---	---	---	---	---	---	---	7.0	---	5.0	---
GhA----------------- Gholson	2e	---	65	---	---	---	75	---	375	---	7.0	---	6.0	---
GhB----------------- Gholson	2e	---	60	---	---	---	70	---	350	---	7.0	---	---	---
GrB----------------- Gredge	3s	---	---	---	---	---	35	---	---	---	6.0	---	5.0	---

Table 6.--Land Capability and Yields Per Acre of Crops and Pasture--Continued

Soil name and map symbol	Land capability		Grain sorghum		Wheat		Corn		Cotton		Improved bermudagrass		Common bermudagrass	
	N	I	N	I	N	I	N	I	N	I	N	I	N	I
			Bu	Bu	Bu	Bu	Bu	Bu	Lbs	Lbs	AUM*	AUM*	AUM*	AUM*
GvB----------------- Greenvine	2e	---	80	---	---	---	55	---	300	---	7.0	---	5.0	---
GvC----------------- Greenvine	3e	---	55	---	---	---	45	---	250	---	7.0	---	6.0	---
GvD4---------------- Greenvine-Gullied land	6e	---	---	---	---	---	---	---	---	---	4.0	---	3.0	---
HvB----------------- Hallettsville	2e	---	70	---	---	---	70	---	---	---	6.0	---	5.0	---
IzA----------------- Inez	2w	---	60	---	---	---	50	---	---	---	7.0	---	6.0	---
JoC----------------- Joiner	3s	---	---	---	---	---	---	---	---	---	6.0	---	5.0	---
KnC----------------- Knolle	3e	---	---	---	---	---	---	---	---	---	5.0	---	4.0	---
KoC----------------- Koether	7s	---	---	---	---	---	---	---	---	---	---	---	---	---
Kr------------------ Krum	2s	---	85	---	40	---	95	---	450	---	6.0	---	4.0	---
KuC----------------- Kurten	4e	---	---	---	---	---	---	---	---	---	5.0	---	4.0	---
LaD----------------- Latium	4e	---	---	---	---	---	30	---	---	---	4.0	---	2.0	---
LaD3---------------- Latium	6e	---	---	---	---	---	---	---	---	---	3.0	---	1.0	---
LgD----------------- Latium	6e	---	---	---	---	---	---	---	---	---	---	---	---	---
LkA----------------- Lufkin	3w	---	35	---	---	---	35	---	250	---	5.0	---	4.0	---
LuC----------------- Luling	3e	---	70	---	---	---	40	---	300	---	3.0	---	2.0	---
Na------------------ Navidad	1	---	90	---	---	---	95	125	---	---	6.0	---	5.0	---
Nd------------------ Navidad	2w	---	75	---	---	---	75	---	---	---	6.0	---	5.0	---
NmC----------------- Normangee	4e	---	45	---	30	---	30	---	225	---	4.0	---	3.0	---
PaC----------------- Padina	3e	---	---	---	---	---	---	---	---	---	4.0	---	3.0	---

Table 6.--Land Capability and Yields Per Acre of Crops and Pasture--Continued

Soil name and map symbol	Land capability		Grain sorghum		Wheat		Corn		Cotton		Improved bermudagrass		Common bermudagrass	
	N	I	N	I	N	I	N	I	N	I	N	I	N	I
			Bu	Bu	Bu	Bu	Bu	Bu	Lbs	Lbs	AUM*	AUM*	AUM*	AUM*
PD------------------ Pits and dumps, saline	8s	---	---	---	---	---	---	---	---	---	---	---	---	---
PS------------------ Pits and dumps, sandy	8s	---	---	---	---	---	---	---	---	---	---	---	---	---
Pu------------------ Pursley	5w	---	---	---	---	---	---	---	---	---	7.0	---	5.0	---
RbC----------------- Rabbs	4e	---	---	---	---	---	---	---	---	---	4.0	---	3.0	---
RhB----------------- Rehburg	3e	---	---	---	---	---	30	---	---	---	6.0	---	4.0	---
RkC----------------- Rek	4e	---	35	---	---	---	---	---	---	---	2.0	---	1.0	---
RnC----------------- Renish-Rock outcrop	6e	---	---	---	---	---	---	---	---	---	---	---	---	---
RnE----------------- Renish-Rock outcrop	7s	---	---	---	---	---	---	---	---	---	---	---	---	---
RoB, RrB------------ Robco	2e	---	---	---	---	---	65	---	---	---	6.0	---	5.0	---
Rt------------------ Roetex	5w	---	---	---	---	---	---	---	---	---	3.0	---	2.0	---
RvA----------------- Rutersville	3w	---	70	---	---	---	55	---	400	---	6.0	---	5.0	---
ScC----------------- Schulenburg	4e	---	35	---	---	---	---	---	---	---	4.0	---	3.0	---
ShC----------------- Shalba	4s	---	---	---	---	---	---	---	---	---	3.0	---	2.0	---
ShC2---------------- Shalba	6e	---	---	---	---	---	---	---	---	---	2.0	---	1.0	---
ShD4----------------- Shalba-Gullied land	7e	---	---	---	---	---	---	---	---	---	---	---	---	---
Sp------------------ Ships	2w	---	90	---	---	---	80	---	550	---	7.0	---	5.0	---
SrB----------------- Shiro	3e	---	---	---	---	---	50	---	200	---	6.0	---	4.0	---
StB----------------- Singleton	4e	---	---	---	---	---	---	---	---	---	5.0	---	3.0	---
SvA----------------- Smithville	1	---	95	---	---	---	90	---	500	---	---	---	9.0	---

Table 6.--Land Capability and Yields Per Acre of Crops and Pasture--Continued

Soil name and map symbol	Land capability N	Land capability I	Grain sorghum N	Grain sorghum I	Wheat N	Wheat I	Corn N	Corn I	Cotton N	Cotton I	Improved bermudagrass N	Improved bermudagrass I	Common bermudagrass N	Common bermudagrass I
			Bu	Bu	Bu	Bu	Bu	Bu	Lbs	Lbs	AUM*	AUM*	AUM*	AUM*
SwC, SxC------------ Straber	3e	---	40	---	---	---	---	---	---	---	5.0	---	4.0	---
SxD----------------- Straber	4e	---	---	---	---	---	---	---	---	---	4.0	---	3.0	---
TrB----------------- Tremona	3e	---	45	---	---	---	---	---	---	---	6.0	---	5.0	---
Tw------------------ Trinity	2w	---	100	---	---	---	70	---	450	---	7.0	---	5.0	---
Uf------------------ Uhland	5w	---	---	---	---	---	---	---	---	---	7.0	---	5.0	---
US------------------ Ustorthents, sandy	3e	---	---	---	---	---	---	---	---	---	3.0	---	2.0	---
Wa**---------------- Warda	2w	---	55	---	---	---	---	---	---	---	6.0	---	4.0	---
We***--------------- Weswood	2w	---	90	---	---	---	95	---	500	---	7.0	---	5.0	---
WsA----------------- Wilson	3w	---	55	---	30	---	45	---	350	---	6.0	---	4.0	---
WwC----------------- Winedale	4e	---	---	---	---	---	---	---	---	---	5.0	---	4.0	---
ZkB----------------- Zack	3s	---	---	---	---	---	---	---	---	---	6.0	---	5.0	---
ZkC----------------- Zack	4e	---	---	---	---	---	---	---	---	---	4.0	---	3.0	---
ZuA----------------- Zulch	3e	---	---	---	---	---	20	---	---	---	5.0	---	4.0	---

* Animal unit month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** Yield for peanuts is 1,400 pounds per acre.

*** Yield for peanuts is 1,600 pounds per acre.

Table 7.--Rangeland Productivity

(Only the soils that support rangeland vegetation suitable for grazing are listed.)

Soil name and map symbol	Ecological site	Potential annual production for kind of growing season		
		Favorable	Normal	Unfavorable
		Lb/acre	Lb/acre	Lb/acre
ArA Arol	Claypan Savannah	5,000	4,200	2,500
Bg Bergstrom	Loamy Bottomland	7,500	6,000	4,000
BkB Bleiblerville	Blackland	7,500	6,000	4,500
Bo Bosque	Loamy Bottomland	6,900	5,300	3,700
BrA Branyon	Blackland	7,000	5,500	3,500
BsD Brenham	Clay Loam	6,500	4,500	3,000
BuA Burleson	Blackland	7,000	5,500	4,000
BwC Burlewash	Claypan Savannah	4,500	3,000	2,000
BwE Burlewash	Gravelly	4,300	3,300	1,700
BwF Burlewash	Gravelly	4,300	3,300	1,700
CaB Cadell	Claypan Prairie	4,400	3,300	2,750
CbC, CbD Carbengle	Clay Loam	5,500	4,000	2,500
CbE4:				
Carbengle	Clay Loam	4,700	3,400	2,100
Gullied land.				
CeC Carmine	Gravelly	3,800	2,600	1,800
ChB Chazos	Loamy Sand	5,000	4,100	2,700
Co Coarsewood	Loamy Bottomland	7,600	6,200	4,800
CrB Crockett	Claypan Prairie	6,000	5,000	3,000
Dg Degola	Loamy Bottomland	7,500	6,000	4,000

Table 7.--Rangeland Productivity--Continued

Soil name and map symbol	Ecological site	Potential annual production for kind of growing season: Favorable	Average	Unfavorable
		Lb/acre	Lb/acre	Lb/acre
DnC: Dubina	Loamy Sand	6,000	4,500	3,000
DtB: Dutek	Loamy Sand	4,500	4,000	2,000
EdD2: Edge	Claypan Savannah	5,000	3,500	2,500
EfB:				
Elmendorf	Blackland	6,000	5,000	4,300
Denhawken	Blackland	5,700	4,750	4,100
FaB: Flatonia	Clay Loam	6,000	4,500	3,000
FrB, FrC, FrD: Frelsburg	Blackland	7,500	6,000	4,500
Ga, Gb, Gd: Gad	Sandy Bottomland	3,800	2,700	2,000
Ge, Gf: Ganado	Clayey Bottomland	6,700	5,500	3,500
GhA, GhB: Gholson	Sandy Loam	5,500	4,500	3,000
GrB: Gredge	Claypan Savannah	5,000	3,500	2,500
GvB, GvC: Greenvine	Blackland	7,000	5,000	3,000
GvD4:				
Greenvine	Eroded Blackland	5,500	4,000	3,000
Gullied land.				
HvB: Hallettsville	Claypan Prairie	6,500	5,000	3,000
IzA: Inez	Sandy Loam	6,500	5,000	4,000
JoC: Joiner	Deep Sand	4,000	2,800	2,000
KnC: Knolle	Loamy Sand	4,500	3,500	1,800
KoC: Koether	Sandstone Hills	2,000	1,000	500
Kr: Krum	Clay Loam	5,500	5,100	3,400
KuC: Kurten	Claypan Savannah	5,000	4,000	2,500

Table 7.--Rangeland Productivity--Continued

Soil name and map symbol	Ecological site	Potential annual production for kind of growing season: Favorable	Average	Unfavorable
		Lb/acre	Lb/acre	Lb/acre
LaD Latium	Blackland	7,200	5,800	4,300
LaD3 Latium	Eroded Blackland	6,000	4,700	3,400
LgD Latium	Blackland	7,100	5,700	4,200
LkA Lufkin	Claypan Savannah	5,000	4,000	2,500
LuC Luling	Blackland	7,200	5,800	4,000
Na, Nd Navidad	Loamy Bottomland	8,000	6,500	5,000
NmC Normangee	Claypan Prairie	5,500	4,000	3,000
PaC Padina	Deep Sand	4,500	3,500	2,250
Pu Pursley	Loamy Bottomland	7,500	5,500	4,000
RbC Rabbs	Clay Loam	6,500	5,000	3,000
RhB Rehburg	Sandy	4,000	3,000	1,500
RkC Rek	Gravelly	3,800	2,600	1,700
RnC:				
Renish	Chalky Ridge	2,700	1,800	900
Rock outcrop.				
RnE:				
Renish	Chalky Ridge	2,600	1,700	850
Rock outcrop.				
RoB, RrB Robco	Sandy	3,600	3,000	2,600
Rt Roetex	Clayey Bottomland	6,000	5,000	3,000
RvA Rutersville	Loamy Sand	5,500	4,000	2,500
ScC Schulenburg	Clay Loam	6,500	5,000	3,000
ShC, ShC2 Shalba	Claypan Savannah	4,500	3,500	2,000

Table 7.--Rangeland Productivity--Continued

Soil name and map symbol	Ecological site	Potential annual production for kind of growing season		
		Favorable	Average	Unfavorable
		Lb/acre	Lb/acre	Lb/acre
ShD4:				
Shalba	Claypan Savannah	3,800	2,900	1,700
Gullied land.				
Sp Ships	Clayey Bottomland	6,800	5,700	4,100
SrB Shiro	Loamy Sand	5,000	4,200	2,500
StB Singleton	Claypan Savannah	5,000	4,000	2,500
SvA Smithville	Loamy Bottomland	7,500	6,000	4,000
SwC, SxC, SxD Straber	Loamy Sand	6,000	4,500	3,000
TrB Tremona	Sandy	5,000	3,500	2,500
Tw Trinity	Clayey Bottomland	6,300	4,600	3,100
Uf Uhland	Loamy Bottomland	7,500	6,500	4,000
US Ustorthents, sandy	Sandy Bottomland	4,000	2,000	1,000
Wa Warda	Loamy Bottomland	8,000	6,500	4,000
We Weswood	Loamy Bottomland	8,000	6,500	5,000
WsA Wilson	Claypan Prairie	6,000	4,500	3,000
WwC Winedale	Claypan Savannah	4,500	3,000	2,000
ZkB, ZkC Zack	Claypan Prairie	4,800	3,800	2,200
ZuA Zulch	Claypan Prairie	5,000	4,000	3,500

Table 8.--Recreational Development

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated.)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
ArA------------------- Arol	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, depth to rock.
Bg-------------------- Bergstrom	Severe: flooding.	Slight----------	Slight----------	Slight----------	Slight.
BkB------------------- Bleiblerville	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey, percs slowly.	Moderate: too clayey.	Severe: too clayey.
Bo-------------------- Bosque	Severe: flooding.	Slight----------	Moderate: flooding.	Slight----------	Moderate: flooding.
BrA------------------- Branyon	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: too clayey.	Moderate: too clayey.	Severe: too clayey.
BsD------------------- Brenham	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
BuA------------------- Burleson	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: too clayey.	Moderate: too clayey.	Severe: too clayey.
BwC------------------- Burlewash	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, depth to rock, percs slowly.	Severe: erodes easily.	Moderate: depth to rock.
BwE, BwF-------------- Burlewash	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Slight----------	Severe: small stones.
CaB------------------- Cadell	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Moderate: wetness.	Moderate: wetness.
CbC------------------- Carbengle	Slight----------	Slight----------	Moderate: slope, depth to rock, small stones.	Slight----------	Moderate: depth to rock.
CbD------------------- Carbengle	Slight----------	Slight----------	Severe: slope.	Slight----------	Moderate: depth to rock.
CbE4:					
Carbengle------------	Slight----------	Slight----------	Severe: slope.	Slight----------	Moderate: depth to rock.
Gullied land.					
CeC------------------- Carmine	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones, droughty.

Table 8.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
ChB------------------- Chazos	Slight----------	Slight----------	Moderate: slope, small stones.	Slight----------	Moderate: droughty.
Co-------------------- Coarsewood	Severe: flooding.	Slight----------	Moderate: flooding.	Slight----------	Moderate: flooding.
CrB------------------- Crockett	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Moderate: droughty.
Dg-------------------- Degola	Severe: flooding.	Slight----------	Moderate: flooding.	Slight----------	Moderate: flooding.
DnC------------------- Dubina	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
DtB------------------- Dutek	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
EdD2------------------ Edge	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope.
EfB:					
Elmendorf------------	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight----------	Slight.
Denhawken------------	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey, percs slowly.	Moderate: too clayey.	Severe: too clayey.
FaB------------------- Flatonia	Slight----------	Slight----------	Moderate: slope, small stones.	Slight----------	Moderate: droughty.
FrB, FrC-------------- Frelsburg	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey, percs slowly.	Moderate: too clayey.	Severe: too clayey.
FrD------------------- Frelsburg	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Severe: slope.	Moderate: too clayey.	Severe: too clayey.
Ga-------------------- Gad	Severe: flooding.	Slight----------	Moderate: too sandy.	Moderate: too sandy.	Moderate: droughty.
Gb-------------------- Gad	Severe: flooding.	Slight----------	Moderate: flooding.	Slight----------	Moderate: droughty, flooding.
Gd-------------------- Gad	Severe: flooding, too sandy.	Severe: too sandy.	Severe: too sandy, flooding.	Severe: too sandy.	Severe: flooding.

Table 8.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Ge: Ganado	Severe: flooding, percs slowly, too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey, percs slowly.	Severe: too clayey.	Severe: too clayey.
Gf: Ganado	Severe: flooding, percs slowly, too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey, flooding, percs slowly.	Severe: too clayey.	Severe: flooding, too clayey.
GhA, GhB: Gholson	Slight	Slight	Slight	Slight	Slight.
GrB: Gredge	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
GvB, GvC: Greenvine	Moderate: percs slowly, too clayey.	Moderate: too clayey percs slowly.	Moderate: slope, too clayey.	Moderate: too clayey.	Severe: too clayey.
GvD4: Greenvine	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey.	Moderate: too clayey.	Severe: too clayey.
Gullied land.					
HvB: Hallettsville	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
IzA: Inez	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight	Slight.
JoC: Joiner	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
KnC: Knolle	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Slight.
KoC: Koether	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, depth to rock.	Moderate: large stones, too sandy.	Severe: large stones, droughty.
Kr: Krum	Severe: flooding.	Moderate: too clayey.	Moderate: small stones, too clayey.	Moderate: too clayey.	Severe: too clayey.
KuC: Kurten	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
LaD: Latium	Moderate: percs slowly.	Moderate: too clayey.	Moderate: slope, too clayey.	Moderate: too clayey.	Severe: too clayey.

Table 8.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
LaD3, LgD: Latium	Moderate: slope, percs slowly.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.	Severe: too clayey.
LkA: Lufkin	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Moderate: droughty.
LuC: Luling	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey, percs slowly.	Moderate: too clayey.	Severe: too clayey.
Na: Navidad	Severe: flooding.	Slight	Slight	Slight	Moderate: droughty.
Nd: Navidad	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: droughty, flooding.
NmC: Normangee	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
PaC: Padina	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty.
PD: Pits and dumps, saline.					
PS: Pits and dumps, sandy.					
Pu: Pursley	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
RbC: Rabbs	Slight	Slight	Severe: slope.	Slight	Slight.
RhB: Rehburg	Moderate: percs slowly, too sandy.	Moderate: too sandy, percs slowly.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
RkC: Rek	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.
RnC: Renish	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Severe: depth to rock.
Rock outcrop.					
RnE: Renish	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: large stones.	Severe: large stones, depth to rock.
RnE: Rock outcrop.					

Table 8.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
RoB: Robco	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: wetness, droughty.
RrB: Robco	Moderate: wetness, too sandy.	Moderate: wetness, too sandy.	Moderate: slope, small stones, too sandy.	Moderate: wetness, too sandy.	Moderate: wetness, droughty.
Rt: Roetex	Severe: flooding, ponding, percs slowly.	Severe: ponding, too clayey, percs slowly.	Severe: too clayey, ponding, flooding.	Severe: ponding, too clayey.	Severe: ponding, flooding, too clayey.
RvA: Rutersville	Slight	Slight	Slight	Slight	Slight.
ScC: Schulenburg	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
ShC, ShC2: Shalba	Severe: wetness, depth to rock.	Severe: depth to rock.	Severe: wetness, depth to rock.	Moderate: wetness.	Severe: depth to rock.
ShD4:					
Shalba	Severe: wetness, depth to rock.	Severe: depth to rock.	Severe: wetness, depth to rock.	Moderate: wetness.	Severe: depth to rock.
Gullied land.					
Sp: Ships	Severe: flooding.	Moderate: too clayey, percs slowly.	Moderate: too clayey, flooding.	Moderate: too clayey.	Severe: too clayey.
SrB: Shiro	Slight	Slight	Moderate: slope, depth to rock.	Slight	Moderate: depth to rock.
StB: Singleton	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, depth to rock.	Slight	Moderate: depth to rock.
SvA: Smithville	Slight	Slight	Slight	Slight	Slight.
SwC: Straber	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
SxC: Straber	Moderate: small stones, percs slowly.	Moderate: small stones, percs slowly.	Severe: small stones.	Slight	Moderate: small stones.
SxD: Straber	Moderate: small stones, percs slowly.	Moderate: small stones, percs slowly.	Severe: slope, small stones.	Slight	Moderate: small stones.

Table 8.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
TrB: Tremona	Moderate: wetness, percs slowly, too sandy.	Moderate: wetness, too sandy, percs slowly.	Moderate: slope, small stones.	Moderate: wetness, too sandy.	Moderate: wetness, droughty.
Tw: Trinity	Severe: flooding, percs slowly, too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey, percs slowly.	Severe: too clayey.	Severe: too clayey.
Uf: Uhland	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.	Moderate: wetness, flooding.	Severe: flooding.
US: Ustorthents, sandy	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty, too sandy.
Wa: Warda	Severe: flooding.	Slight	Moderate: small stones, flooding.	Slight	Moderate: flooding.
We: Weswood	Severe: flooding.	Slight	Slight	Slight	Moderate: flooding.
WsA: Wilson	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Moderate: droughty.
WwC: Winedale	Moderate: small stones, percs slowly.	Moderate: small stones, percs slowly.	Severe: small stones.	Slight	Moderate: small stones.
ZkB: Zack	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Slight.
ZkC: Zack	Moderate: small stones, percs slowly.	Moderate: small stones, percs slowly.	Severe: small stones.	Slight	Moderate: small stones.
ZuA: Zulch	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Slight.

Table 9.--Wildlife Habitat

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated.)

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
ArA: Arol	Fair	Good	Fair	Fair	---	Fair	Fair	Fair	Fair	Fair	Fair	Fair.
Bg: Bergstrom	Good	Good	Fair	---	---	Fair	Poor	Very poor.	Good	---	Very poor.	Fair.
BkB: Bleiblerville	Good	Good	Fair	---	---	Fair	Poor	Poor	Good	---	Poor	Fair.
Bo: Bosque	Good	Good	Good	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
BrA: Branyon	Good	Good	Poor	---	---	Fair	Poor	Poor	Fair	---	Poor	Fair.
BsD: Brenham	Fair	Good	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
BuA: Burleson	Good	Good	Poor	---	---	Poor	Very poor.	Very poor.	Fair	---	Very poor.	Poor.
BwC: Burlewash	Fair	Good	Good	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
BwE, BwF: Burlewash	Poor	Fair	Good	---	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Good.
CaB: Cadell	Fair	Good	Good	Fair	---	Good	Poor	Very poor.	Good	Fair	Very poor.	Good.
CbC, CbD: Carbengle	Fair	Good	Good	---	---	Fair	Poor	Very poor.	Good	---	Very poor.	Fair.
CbE4:												
Carbengle	Fair	Good	Good	---	---	Fair	Poor	Very poor.	Good	---	Very poor.	Fair.
Gullied land.												
CeC: Carmine	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	---	Fair.
ChB: Chazos	Fair	Good	Good	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
Co: Coarsewood	Good	Good	Good	Good	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
CrB: Crockett	Fair	Good	Good	Good	---	Good	Poor	Poor	Good	---	Poor	Good.
Dg: Degola	Good	Good	Fair	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Fair.

Table 9.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
DnC---------------- Dubina	Fair	Fair	Good	Good	---	Good	Poor	Very poor.	Fair	---	Very poor.	Good.
DtB---------------- Dutek	Poor	Fair	Good	Fair	---	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
EdD2--------------- Edge	Poor	Fair	Good	Good	---	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
EfB:												
Elmendorf---------	Good	Good	Fair	---	---	Good	Very poor.	Very poor.	Good	---	Very poor.	Fair.
Denhawken---------	Fair	Good	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
FaB---------------- Flatonia	Good	Good	Good	---	---	Fair	Very poor.	Very poor.	Good	---	Very poor.	Fair.
FrB---------------- Frelsburg	Good	Good	Fair	---	---	Fair	Poor	Very poor.	Good	---	Very poor.	Fair.
FrC, FrD----------- Frelsburg	Fair	Good	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Ga----------------- Gad	Fair	Good	Good	Fair	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.	Fair.
Gb----------------- Gad	Fair	Fair	Good	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Gd----------------- Gad	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Ge, Gf------------- Ganado	Poor	Fair	Fair	Good	---	Good	Poor	Poor	Fair	Good	Very poor.	---
GhA, GhB----------- Gholson	Fair	Good	Good	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
GrB---------------- Gredge	Fair	Good	Good	Good	---	Good	Poor	Very poor.	Good	Good	Very poor.	Good.
GvB---------------- Greenvine	Good	Good	Fair	---	---	Fair	Poor	Poor	Good	---	Poor	Fair.
GvC---------------- Greenvine	Fair	Good	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
GvD4:												
Greenvine---------	Fair	Good	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Gullied land.												
HvB---------------- Hallettsville	Fair	Good	Fair	---	---	Good	Poor	Poor	Fair	---	Poor	Good.

Table 9.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
IzA---------------- Inez	Fair	Good	Good	Good	---	Fair	Fair	Fair	Good	Good	Fair	Fair.
JoC---------------- Joiner	Fair	Fair	Fair	---	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
KnC---------------- Knolle	Fair	Fair	Good	---	---	Good	Poor	Very poor.	Fair	---	Very poor.	Good.
KoC---------------- Koether	Very poor.	Very poor.	Very poor.	---	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Very poor.
Kr----------------- Krum	Good	Good	Fair	---	---	Fair	Poor	Very poor.	Good	---	Very poor.	Fair.
KuC---------------- Kurten	Fair	Fair	Good	Good	---	Good	Poor	Very poor.	Fair	Good	Very poor.	Good.
LaD, LaD3, LgD----- Latium	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	---
LkA---------------- Lufkin	Fair	Good	Fair	Good	Good	---	Fair	Fair	Fair	Good	Fair	---
LuC---------------- Luling	Fair	Good	Poor	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Poor.
Na, Nd------------- Navidad	Poor	Fair	Fair	---	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
NmC---------------- Normangee	Fair	Fair	Fair	---	---	Fair	Poor	Poor	Fair	---	Poor	Fair.
PaC---------------- Padina	Fair	Good	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
PD----------------- Pits and dumps, saline.												
PS----------------- Pits and dumps, sandy.												
Pu----------------- Pursley	Very poor.	Poor	Fair	---	---	Good	Poor	Very poor.	Poor	---	Very poor.	Fair.
RbC---------------- Rabbs	Poor	Fair	Good	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
RhB---------------- Rehburg	Fair	Good	Good	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
RkC---------------- Rek	Poor	Poor	Fair	---	---	Fair	Poor	Poor	Poor	---	Poor	Fair.

Table 9.--wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
RnC:												
Renish	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Rock outcrop	---	---	---	---	---	---	---	---	---	---	---	---
RnE:												
Renish	Very poor.	Very poor.	Very poor.	---	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Very poor.
Rock outcrop	---	---	---	---	---	---	---	---	---	---	---	---
RoB, RrB Robco	Fair	Fair	Good	---	---	Good	Poor	Very poor.	Fair	---	Very poor.	Good.
Rt Roetex	Very poor.	Poor	Fair	---	---	Fair	Poor	Good	Poor	---	Fair	Fair.
RvA Rutersville	Fair	Good	Good	---	---	Good	Fair	Fair	Good	---	Fair	Good.
ScC Schulenburg	Good	Good	Good	---	---	Fair	Poor	Poor	Good	---	Poor	Fair.
ShC, ShC2 Shalba	Poor	Poor	Poor	---	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Poor.
ShD4:												
Shalba	Poor	Poor	Poor	---	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Poor.
Gullied land.												
Sp Ships	Good	Good	Fair	---	---	Fair	Poor	Poor	Good	---	Poor	Fair.
SrB Shiro	Fair	Good	Good	Fair	Fair	---	Poor	Very poor.	Good	Fair	Poor	---
StB Singleton	Fair	Good	Fair	Fair	---	Good	Poor	Poor	Fair	Fair	Poor	Fair.
SvA Smithville	Good	Good	Good	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
SwC, SxC, SxD Straber	Fair	Good	Good	---	---	Good	Poor	Poor	Good	---	Poor	Good.
TrB Tremona	Fair	Good	Good	---	---	Good	Very poor.	Very poor.	Good	---	Very poor.	Good.
Tw Trinity	Fair	Good	Fair	Good	---	---	Poor	Fair	Fair	Good	Poor	---
Uf Uhland	Poor	Fair	Fair	Good	---	Good	Fair	Fair	Fair	---	Fair	Fair.

Table 9.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hardwood trees	Conif-erous plants	Shrubs	Wetland plants	Shallow water areas	Open-land wild-life	Wood-land wild-life	Wetland wild-life	Range-land wild-life
US----------------- Ustorthents, sandy	Poor	Poor	Poor	Poor	---	Poor	Poor	Poor	Fair	Poor	Poor	Fair.
Wa----------------- Warda	Good	Good	Good	---	---	Good	Poor	Poor	Good	---	Very poor.	Good.
We----------------- Weswood	Good	Good	Fair	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Fair.
WsA---------------- Wilson	Fair	Fair	Good	---	---	Fair	Fair	Fair	Fair	---	Fair	Fair.
WwC---------------- Winedale	Fair	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Very poor.	Good.
ZkB, ZkC----------- Zack	Fair	Good	Good	Good	---	Good	Poor	Very poor.	Good	Good	Very poor.	Good.
ZuA---------------- Zulch	Fair	Good	Good	Good	---	Fair	Fair	Fair	Good	---	Fair	Fair.

Table 10.--Building Site Development

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
ArA: Arol	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: wetness, depth to rock.
Bg: Bergstrom	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength.	Slight.
BkB: Bleiblerville	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
Bo: Bosque	Moderate: too clayey, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.
BrA: Branyon	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
BsD: Brenham	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
BuA: Burleson	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
BwC: Burlewash	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: depth to rock.
BwE, BwF: Burlewash	Moderate: depth to rock, too clayey, slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: slope shrink-swell, low strength.	Severe: small stones, slope (BwF).
CaB: Cadell	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength.	Moderate: wetness.
CbC, CbD: Carbengle	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Moderate: low strength.	Moderate: depth to rock.
CbE4:						
Carbengle	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Moderate: low strength.	Moderate: depth to rock.
Gullied land.						
CeC: Carmine	Severe: cutbanks cave.	Slight	Severe: shrink-swell.	Slight	Slight	Severe: small stones, droughty.

Table 10.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
ChB--------------- Chazos	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Moderate: droughty.
Co---------------- Coarsewood	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
CrB--------------- Crockett	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty.
Dg---------------- Degola	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
DnC--------------- Dubina	Slight---------	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
DtB--------------- Dutek	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
EdD2-------------- Edge	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: slope.
EfB:						
Elmendorf--------	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
Denhawken--------	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
FaB--------------- Flatonia	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty.
FrB, FrC, FrD----- Frelsburg	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
Ga---------------- Gad	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: droughty.
Gb---------------- Gad	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: droughty, flooding.
Gd---------------- Gad	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
Ge---------------- Ganado	Severe: cutbanks cave.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Severe: too clayey.
Gf---------------- Ganado	Severe: cutbanks cave.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Severe: flooding, too clayey.

Table 10.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
GhA, GhB---------- Gholson	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: low strength.	Slight.
GrB--------------- Gredge	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
GvB, GvC---------- Greenvine	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
GvD4:						
Greenvine--------	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
Gullied land.						
HvB--------------- Hallettsville	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
IzA--------------- Inez	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
JoC--------------- Joiner	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty, too sandy.
KnC--------------- Knolle	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Slight.
KoC--------------- Koether	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, droughty.
Kr---------------- Krum	Moderate: too clayey.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
KuC--------------- Kurten	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
LaD--------------- Latium	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
LaD3, LgD--------- Latium	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Severe: too clayey.
LkA--------------- Lufkin	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty.
LuC--------------- Luling	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
Na---------------- Navidad	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: droughty.

Table 10.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Nd---------------- Navidad	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: droughty, flooding.
NmC--------------- Normangee	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
PaC--------------- Padina	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
PD---------------- Pits and dumps, saline.						
PS---------------- Pits and dumps, sandy.						
Pu---------------- Pursley	Moderate: too clayey, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding.
RbC--------------- Rabbs	Slight---------	Slight---------	Slight---------	Moderate: slope.	Moderate: low strength.	Slight.
RhB--------------- Rehburg	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Moderate: droughty.
RkC--------------- Rek	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: small stones.
RnC:						
Renish-----------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Rock outcrop.						
RnE:						
Renish-----------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: large stones, depth to rock, slope.
Rock outcrop.						
RoB, RrB---------- Robco	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness, shrink-swell.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
Rt---------------- Roetex	Severe: cutbanks cave, ponding.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding, flooding, too clayey.

Table 10.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
RvA----------------- Rutersville	Moderate: wetness.	Severe: shrink-swell.	Moderate: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
ScC----------------- Schulenburg	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.	Slight.
ShC, ShC2--------- Shalba	Severe: depth to rock, wetness.	Severe: wetness, shrink-swell.	Severe: wetness, depth to rock, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength.	Severe: depth to rock.
ShD4:						
Shalba-----------	Severe: depth to rock, wetness.	Severe: wetness, shrink-swell.	Severe: wetness, depth to rock, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength.	Severe: depth to rock.
Gullied land.						
Sp------------------ Ships	Severe: cutbanks cave.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Severe: too clayey.
SrB----------------- Shiro	Moderate: depth to rock.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: depth to rock.
StB----------------- Singleton	Moderate: depth to rock.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: depth to rock.
SvA----------------- Smithville	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
SwC----------------- Straber	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
SxC, SxD---------- Straber	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: small stones.
TrB----------------- Tremona	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness, shrink-swell.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
Tw------------------ Trinity	Severe: cutbanks cave.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Severe: too clayey.
Uf------------------ Uhland	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.

Table 10.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
US---------------- Ustorthents, sandy	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Severe: droughty, too sandy.
Wa---------------- Warda	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
We---------------- Weswood	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.
WsA--------------- Wilson	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty.
WwC--------------- Winedale	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: small stones.
ZkB--------------- Zack	Moderate: too clayey.	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell.	Severe: low strength.	Slight.
ZkC--------------- Zack	Moderate: too clayey.	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell.	Severe: low strength.	Moderate: small stones.
ZuA--------------- Zulch	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.

Table 11.--Sanitary Facilities

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
ArA: Arol	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock.	Severe: depth to rock, wetness, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
Bg: Bergstrom	Moderate: flooding, percs slowly.	Moderate: seepage.	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey.
BkB: Bleiblerville	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Bo: Bosque	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Fair: too clayey, thin layer.
BrA: Branyon	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
BsD: Brenham	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
BuA: Burleson	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
BwC: Burlewash	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
BwE, BwF: Burlewash	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey.
CaB: Cadell	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey.
CbC, CbD: Carbengle	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
CbE4:					
Carbengle	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
Gullied land.					

Table 11.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
CeC Carmine	Severe: wetness, percs slowly, poor filter.	Severe: seepage.	Moderate: wetness.	Severe: seepage.	Poor: small stones.
ChB Chazos	Severe: percs slowly.	Severe: seepage.	Moderate: too clayey.	Slight	Poor: hard to pack.
Co Coarsewood	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Good.
CrB Crockett	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Dg Degola	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
DnC Dubina	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Poor: hard to pack.
DtB Dutek	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
EdD2 Edge	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
EfB:					
Elmendorf	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Denhawken	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
FaB Flatonia	Severe: wetness, percs slowly.	Moderate: depth to rock, slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey, hard to pack.
FrB, FrC, FrD Frelsburg	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Ga Gad	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
Gb, Gd Gad	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy.
Ge, Gf Ganado	Severe: flooding, percs slowly.	Severe: flooding.	Severe: flooding, too clayey.	Severe: flooding.	Poor: too clayey, hard to pack.

Table 11.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
GhA, GhB: Gholson	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too clayey.
GrB: Gredge	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Poor: hard to pack.
GvB, GvC: Greenvine	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
GvD4:					
Greenvine	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
Gullied land.					
HvB: Hallettsville	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
IzA: Inez	Severe: percs slowly.	Moderate: seepage.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
JoC: Joiner	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
KnC: Knolle	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight	Fair: too clayey.
KoC: Koether	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock.	Poor: depth to rock, seepage, large stones.
Kr: Krum	Severe: percs slowly.	Slight	Severe: too clayey.	Moderate: flooding.	Poor: too clayey, hard to pack.
KuC: Kurten	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
LaD: Latium	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
LaD3, LgD: Latium	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
LkA: Lufkin	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.

Table 11.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
LuC----------------- Luling	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
Na------------------ Navidad	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: too sandy.
Nd------------------ Navidad	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, too sandy.	Severe: flooding, seepage.	Poor: too sandy.
NmC----------------- Normangee	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
PaC----------------- Padina	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
PD------------------ Pits and dumps, saline.					
PS------------------ Pits and dumps, sandy.					
Pu------------------ Pursley	Severe: flooding.	Severe: flooding.	Severe: flooding, too clayey.	Severe: flooding.	Poor: too clayey.
RbC----------------- Rabbs	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
RhB----------------- Rehburg	Severe: wetness, percs slowly.	Severe: seepage.	Severe: depth to rock, too clayey.	Severe: seepage.	Poor: too clayey, hard to pack.
RkC----------------- Rek	Severe: wetness, percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
RnC:					
Renish-------------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Rock outcrop.					
RnE:					
Renish-------------	Severe: depth to rock. slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, large stones, slope.	Severe: depth to rock, slope.	Poor: depth to rock, large stones, slope.
Rock outcrop.					

Table 11.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
RoB, RrB----------- Robco	Severe: wetness, percs slowly, poor filter.	Severe: seepage.	Severe: wetness.	Severe: seepage.	Poor: thin layer.
Rt----------------- Roetex	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding, too clayey.	Severe: flooding, ponding.	Poor: too clayey, hard to pack, ponding.
RvA---------------- Rutersville	Severe: wetness, percs slowly.	Severe: seepage.	Severe: depth to rock.	Moderate: depth to rock, wetness.	Poor: hard to pack.
ScC---------------- Schulenburg	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight-----------	Fair: too clayey.
ShC, ShC2---------- Shalba	Severe: depth to rock, wetness.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness, too clayey.	Severe: depth to rock, wetness.	Poor: depth to rock, too clayey, hard to pack.
ShD4:					
Shalba-------------	Severe: depth to rock, wetness.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness, too clayey.	Severe: depth to rock, wetness.	Poor: depth to rock, too clayey, hard to pack.
Gullied land.					
Sp----------------- Ships	Severe: flooding, percs slowly.	Severe: flooding.	Severe: flooding, too clayey.	Severe: flooding.	Poor: too clayey, hard to pack.
SrB---------------- Shiro	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, wetness.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
StB---------------- Singleton	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
SvA---------------- Smithville	Moderate: percs slowly.	Moderate: seepage.	Slight-----------	Slight-----------	Good.
SwC, SxC, SxD------ Straber	Severe: percs slowly.	Severe: seepage.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
TrB---------------- Tremona	Severe: wetness, percs slowly, poor filter.	Severe: seepage.	Severe: wetness, too clayey.	Severe: seepage.	Poor: too clayey, hard to pack.

Table 11.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Tw: Trinity	Severe: flooding, percs slowly.	Severe: flooding.	Severe: flooding, too clayey.	Severe: flooding.	Poor: too clayey, hard to pack.
Uf: Uhland	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
US: Ustorthents, sandy	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Wa: Warda	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
We: Weswood	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
WsA: Wilson	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey hard to pack.
WwC: Winedale	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
ZkB, ZkC: Zack	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
ZuA: Zulch	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.

Table 12.--Construction Materials

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
ArA------------------- Arol	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Bg-------------------- Bergstrom	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
BkB------------------- Bleiblerville	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Bo-------------------- Bosque	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
BrA------------------- Branyon	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
BsD------------------- Brenham	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
BuA------------------- Burleson	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
BwC, BwE, BwF--------- Burlewash	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
CaB------------------- Cadell	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
CbC, CbD-------------- Carbengle	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, too clayey, small stones.
CbE4:				
Carbengle------------	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, too clayey, small stones.
Gullied land.				
CeC------------------- Carmine	Poor: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, small stones, area reclaim.
ChB------------------- Chazos	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.

Table 12.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Co-------------------- Coarsewood	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Good.
CrB------------------- Crockett	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Dg-------------------- Degola	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
DnC------------------- Dubina	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
DtB------------------- Dutek	Good-----------------	Probable-------------	Improbable: too sandy.	Poor: too sandy.
EdD2------------------ Edge	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
EfB:				
Elmendorf------------	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Denhawken------------	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
FaB------------------- Flatonia	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
FrB, FrC, FrD--------- Frelsburg	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Ga, Gb, Gd------------ Gad	Good-----------------	Probable-------------	Improbable: too sandy.	Poor: too sandy.
Ge, Gf---------------- Ganado	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
GhA, GhB-------------- Gholson	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
GrB------------------- Gredge	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
GvB, GvC-------------- Greenvine	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
GvD4:				
Greenvine------------	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
GvD4: Gullied land.				

Table 12.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
HvB------------------- Hallettsville	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
IzA------------------- Inez	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
JoC------------------- Joiner	Good-----------------	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
KnC------------------- Knolle	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
KoC------------------- Koether	Poor: depth to rock.	Improbable: thin layer.	Improbable: too sandy.	Poor: depth to rock, large stones.
Kr-------------------- Krum	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
KuC------------------- Kurten	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
LaD, LaD3, LgD-------- Latium	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
LkA------------------- Lufkin	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
LuC------------------- Luling	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Na, Nd---------------- Navidad	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
NmC------------------- Normangee	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
PaC------------------- Padina	Good-----------------	Probable-------------	Improbable: too sandy.	Poor: too sandy.
PD-------------------- Pits and dumps, saline.				
PS-------------------- Pits and dumps, sandy.				
Pu-------------------- Pursley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer.
RbC------------------- Rabbs	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.

Table 12.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
RhB: Rehburg	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
RkC: Rek	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
RnC:				
Renish	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
Rock outcrop.				
RnE:				
Renish	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, large stones.
Rock outcrop.				
RoB: Robco	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
RrB: Robco	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
Rt: Roetex	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
RvA: Rutersville	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
ScC: Schulenburg	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
ShC, ShC2: Shalba	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey.
ShD4:				
Shalba	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey.
Gullied land.				
Sp: Ships	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
SrB: Shiro	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.

Table 12.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
StB------------------- Singleton	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
SvA------------------- Smithville	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
SwC------------------- Straber	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
SxC, SxD-------------- Straber	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
TrB------------------- Tremona	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
Tw-------------------- Trinity	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Uf-------------------- Uhland	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
US-------------------- Ustorthents, sandy	Good-----------------	Probable-------------	Improbable: too sandy.	Poor: too sandy.
Wa-------------------- Warda	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
We-------------------- Weswood	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
WsA------------------- Wilson	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
WwC------------------- Winedale	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
ZkB------------------- Zack	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
ZkC------------------- Zack	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
ZuA-------------------- Zulch	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

Table 13.--Water Management

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation.)

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
ArA: Arol	Moderate: depth to rock.	Severe: hard to pack.	Percs slowly, depth to rock.	Wetness, soil blowing, percs slowly.	Depth to rock, erodes easily, wetness.	Erodes easily, depth to rock, percs slowly.
Bg: Bergstrom	Moderate: seepage.	Moderate: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
BkB: Bleiblerville	Slight	Severe: hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly	Percs slowly.
Bo: Bosque	Moderate: seepage.	Severe: piping.	Deep to water	Flooding	Favorable	Favorable.
BrA: Branyon	Slight	Severe: hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly	Percs slowly.
BsD: Brenham	Moderate: seepage, slope.	Moderate: thin layer, hard to pack.	Deep to water	Slope	Favorable	Favorable.
BuA: Burleson	Slight	Severe: hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly	Percs slowly.
BwC: Burlewash	Moderate: depth to rock.	Severe: thin layer.	Deep to water	Slope, soil blowing.	Depth to rock, erodes easily.	Erodes easily, depth to rock.
BwE, BwF: Burlewash	Moderate: depth to rock.	Moderate: thin layer.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock.	Slope, depth to rock, percs slowly.
CaB: Cadell	Slight	Moderate: wetness.	Percs slowly	Wetness, soil blowing.	Erodes easily, wetness, soil blowing.	Erodes easily, percs slowly.
CbC, CbD: Carbengle	Moderate: seepage, depth to rock, slope.	Moderate: thin layer, piping.	Deep to water	Depth to rock, slope.	Depth to rock	Depth to rock.
CbE4:						
Carbengle	Moderate: seepage, depth to rock, slope.	Moderate: thin layer, piping.	Deep to water	Depth to rock, slope.	Depth to rock	Depth to rock.
Gullied land.						
CeC: Carmine	Severe: seepage.	Moderate: wetness.	Percs slowly, slope.	Slope, wetness, droughty.	Wetness, percs slowly.	Droughty, percs slowly.
ChB: Chazos	Slight	Moderate: hard to pack.	Deep to water	Droughty, fast intake.	Soil blowing, percs slowly.	Droughty, percs slowly.

Table 13.--Water Management--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Co----------------- Coarsewood	Severe: seepage.	Severe: piping.	Deep to water	Erodes easily, flooding.	Erodes easily	Erodes easily.
CrB---------------- Crockett	Slight---------	Severe: hard to pack.	Deep to water	Droughty, percs slowly.	Erodes easily, percs slowly.	Erodes easily, droughty.
Dg----------------- Degola	Moderate: seepage.	Moderate: piping.	Deep to water	Flooding-------	Favorable------	Favorable.
DnC---------------- Dubina	Slight---------	Moderate: thin layer, piping, hard to pack.	Deep to water	Slope, fast intake, soil blowing.	Soil blowing, percs slowly.	Percs slowly.
DtB---------------- Dutek	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake.	Too sandy, soil blowing.	Droughty.
EdD2--------------- Edge	Slight---------	Severe: hard to pack.	Deep to water	Slope, percs slowly.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
EfB:						
Elmendorf--------	Slight---------	Moderate: hard to pack, excess salt.	Deep to water	Percs slowly---	Percs slowly---	Percs slowly.
Denhawken--------	Slight---------	Severe: hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly---	Percs slowly.
FaB---------------- Flatonia	Slight---------	Severe: hard to pack.	Deep to water	Droughty, percs slowly.	Percs slowly---	Droughty, percs slowly.
FrB---------------- Frelsburg	Slight---------	Severe: hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly---	Percs slowly.
FrC, FrD----------- Frelsburg	Slight---------	Severe: hard to pack.	Deep to water	Slope, slow intake, percs slowly.	Percs slowly---	Percs slowly.
Ga----------------- Gad	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake.	Too sandy, soil blowing.	Droughty.
Gb, Gd------------- Gad	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
Ge, Gf------------- Ganado	Slight---------	Severe: hard to pack.	Deep to water	Slow intake, percs slowly, flooding.	Percs slowly---	Percs slowly.
GhA, GhB----------- Gholson	Severe: seepage.	Severe: thin layer.	Deep to water	Soil blowing---	Erodes easily, soil blowing.	Erodes easily.
GrB---------------- Gredge	Slight---------	Moderate: hard to pack.	Deep to water	Soil blowing, percs slowly.	Erodes easily, soil blowing, percs slowly.	Erodes easily, percs slowly.

Table 13.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
GvB: Greenvine	Moderate: depth to rock.	Severe: hard to pack.	Percs slowly, depth to rock.	Slow intake	Depth to rock, percs slowly.	Depth to rock, percs slowly.
GvC: Greenvine	Moderate: depth to rock.	Severe: hard to pack.	Percs slowly, depth to rock, slope.	Slope, slow intake.	Depth to rock, percs slowly.	Depth to rock, percs slowly.
GvD4:						
Greenvine	Moderate: depth to rock.	Severe: hard to pack.	Percs slowly, depth to rock, slope.	Slope, slow intake.	Depth to rock, percs slowly.	Depth to rock, percs slowly.
Gullied land.						
HvB: Hallettsville	Slight	Moderate: hard to pack.	Deep to water	Soil blowing, percs slowly.	Erodes easily, soil blowing, percs slowly.	Erodes easily, percs slowly.
IzA: Inez	Slight	Severe: hard to pack.	Deep to water	Soil blowing, percs slowly.	Erodes easily, soil blowing, percs slowly.	Erodes easily, percs slowly.
JoC: Joiner	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
KnC: Knolle	Severe: seepage.	Moderate: thin layer, piping.	Deep to water	Fast intake, slope, soil blowing.	Soil blowing	Favorable.
KoC: Koether	Severe: depth to rock, seepage.	Severe: seepage, piping, large stones.	Deep to water	Slope, large stones, droughty.	Large stones, depth to rock.	Large stones, droughty.
Kr: Krum	Slight	Severe: hard to pack.	Deep to water	Droughty, slow intake.	Favorable	Droughty.
KuC: Kurten	Slight	Severe: hard to pack.	Deep to water	Slope, soil blowing, percs slowly.	Erodes easily, soil blowing, percs slowly.	Erodes easily, percs slowly.
LaD: Latium	Slight	Severe: hard to pack.	Deep to water	Slope, slow intake, percs slowly.	Percs slowly	Percs slowly.
LaD3, LgD: Latium	Slight	Severe: hard to pack.	Deep to water	Slope, slow intake, percs slowly.	Slope, percs slowly.	Slope, percs slowly.
LkA: Lufkin	Slight	Severe: hard to pack.	Percs slowly	Percs slowly	Erodes easily, percs slowly.	Erodes easily, percs slowly.
LuC: Luling	Slight	Severe: hard to pack.	Deep to water	Slope, slow intake, percs slowly.	Percs slowly	Percs slowly.

Table 13.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
Na-------------- Navidad	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, rooting depth.	Too sandy------	Droughty, rooting depth.
Nd-------------- Navidad	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, rooting depth, flooding.	Too sandy------	Droughty, rooting depth.
NmC------------- Normangee	Slight---------	Severe: hard to pack.	Deep to water	Slope, percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
PaC------------- Padina	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
PD-------------- Pits and dumps, saline.						
PS-------------- Pits and dumps, sandy.						
Pu-------------- Pursley	Moderate: seepage.	Moderate: piping.	Deep to water	Flooding-------	Favorable------	Favorable.
RbC------------- Rabbs	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope----------	Favorable------	Favorable.
RhB------------- Rehburg	Severe: seepage.	Severe: thin layer.	Deep to water	Droughty, fast intake.	Erodes easily, soil blowing, percs slowly.	Erodes easily, droughty, percs slowly.
RkC------------- Rek	Moderate: seepage, slope.	Severe: hard to pack.	Percs slowly, slope.	Slope, wetness, percs slowly.	Wetness, percs slowly.	Rooting depth, percs slowly.
RnC:						
Renish----------	Severe: depth to rock.	Severe: piping.	Deep to water	Slope, depth to rock.	Depth to rock	Depth to rock.
Rock outcrop.						
RnE:						
Renish----------	Severe: depth to rock, slope.	Severe: piping, large stones.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop.						
RoB, RrB-------- Robco	Severe: seepage.	Moderate: wetness.	Percs slowly---	Wetness--------	Erodes easily, wetness, percs slowly.	Erodes easily, droughty, percs slowly.

Table 13.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Rt: Roetex	Slight	Severe: hard to pack, ponding.	Ponding, percs slowly, flooding.	Ponding, slow intake, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.
RvA: Rutersville	Moderate: depth to rock.	Moderate: thin layer, hard to pack, wetness.	Percs slowly	Wetness, fast intake, soil blowing.	Wetness, soil blowing, percs slowly.	Percs slowly.
ScC: Schulenburg	Severe: seepage.	Moderate: thin layer, piping.	Deep to water	Slope	Favorable	Favorable.
ShC, ShC2: Shalba	Severe: depth to rock.	Severe: hard to pack.	Percs slowly, depth to rock, slope.	Slope, wetness, soil blowing.	Depth to rock, erodes easily, wetness.	Wetness, erodes easily, depth to rock.
ShD4:						
Shalba	Severe: depth to rock.	Severe: hard to pack.	Percs slowly, depth to rock, slope.	Slope, wetness, soil blowing.	Depth to rock, erodes easily, wetness.	Wetness, erodes easily, depth to rock.
Gullied land.						
Sp: Ships	Slight	Severe: hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly	Percs slowly.
SrB: Shiro	Moderate: depth to rock.	Severe: thin layer.	Percs slowly, depth to rock.	Wetness, fast intake.	Depth to rock, wetness, soil blowing.	Depth to rock, percs slowly.
StB: Singleton	Moderate: depth to rock.	Severe: thin layer.	Percs slowly, depth to rock.	Soil blowing	Depth to rock, erodes easily.	Erodes easily, depth to rock, percs slowly.
SvA: Smithville	Moderate: seepage.	Moderate: thin layer.	Deep to water	Soil blowing	Soil blowing	Favorable.
SwC, SxC, SxD: Straber	Slight	Moderate: hard to pack.	Deep to water	Slope, fast intake, soil blowing.	Soil blowing, percs slowly.	Percs slowly.
TrB: Tremona	Severe: seepage.	Moderate: hard to pack, wetness.	Percs slowly	Wetness, droughty.	Wetness, soil blowing, percs slowly.	Droughty, percs slowly.
Tw: Trinity	Slight	Severe: hard to pack.	Percs slowly, flooding.	Droughty, slow intake.	Percs slowly	Droughty, percs slowly.
Uf: Uhland	Slight	Severe: piping, wetness.	Flooding	Wetness, flooding.	Wetness	Erodes easily.
US: Ustorthents, sandy	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty, rooting depth.

Table 13.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
Wa---------------- Warda	Moderate: seepage.	Moderate: piping, wetness.	Deep to water	Soil blowing, erodes easily, flooding.	Erodes easily, soil blowing.	Erodes easily.
We----------------- Weswood	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily, flooding.	Erodes easily	Erodes easily.
WsA--------------- Wilson	Slight---------	Severe: hard to pack.	Percs slowly---	Percs slowly---	Erodes easily, percs slowly.	Erodes easily, percs slowly.
WwC--------------- Winedale	Moderate: slope.	Severe: hard to pack.	Deep to water	Slope, percs slowly, excess salt.	Percs slowly---	Percs slowly.
ZkB--------------- Zack	Slight---------	Moderate: piping.	Deep to water	Soil blowing, percs slowly.	Erodes easily, soil blowing.	Erodes easily, percs slowly.
ZkC--------------- Zack	Slight---------	Moderate: piping.	Deep to water	Slope, percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
ZuA--------------- Zulch	Slight---------	Severe: hard to pack.	Percs slowly---	Percs slowly---	Erodes easily, soil blowing.	Erodes easily, percs slowly.

Table 14.--Engineering Index Properties

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated.)

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
ArA------------- Arol	0-5	Fine sandy loam	SC-SM, SM, CL-ML, ML	A-4	0	98-100	95-100	70-85	40-55	<20	NP-7
	5-37	Clay, clay loam	CH	A-7	0	98-100	95-100	90-100	70-95	51-70	34-48
	37-54	Weathered bedrock	---	---	---	---	---	---	---	---	---
Bg--------------- Bergstrom	0-4	Silt loam--------	CL	A-4, A-6, A-7-6	0	95-100	95-100	95-100	85-97	28-46	8-25
	4-18	Silt loam, silty clay loam.	CL	A-6, A-7-6	0	95-100	95-100	95-100	85-97	32-46	12-25
	18-56	Silty clay loam, silt loam, clay loam.	CL	A-6, A-7-6	0	95-100	95-100	95-100	85-97	32-46	12-25
	56-80	Stratified loam to clay.	CL	A-6, A-7-6	0	95-100	95-100	95-100	85-97	30-45	11-25
BkB-------------- Bleiblerville	0-10	Clay-------------	CH	A-7-6	0	95-100	95-100	90-100	80-100	55-85	35-60
	10-45	Clay, silty clay	CH	A-7-6	0	95-100	95-100	90-100	80-100	55-85	35-60
	45-80	Clay, silty clay	CH	A-7-6	0	95-100	95-100	90-100	80-100	55-85	35-60
Bo--------------- Bosque	0-28	Sandy clay loam	CL, CL-ML, SC	A-4, A-6, A-7-6	0	100	95-100	80-90	45-70	23-45	7-25
	28-58	Loam, clay loam, sandy clay loam.	CL, CL-ML	A-6, A-7-6, A-4	0	100	95-100	80-90	50-85	23-45	7-25
	58-80	Loam, clay loam, clay.	CL, CL-ML	A-4, A-6, A-7-6	0	98-100	95-100	85-100	65-94	23-49	7-29
BrA-------------- Branyon	0-16	Clay-------------	CH	A-7-6	0	95-100	85-100	80-100	75-100	54-80	35-55
	16-59	Clay, silty clay	CH	A-7-6	0	95-100	85-100	80-100	75-100	54-80	35-55
	59-75	Clay, silty clay	CH	A-6, A-7	0	90-100	85-100	80-100	75-100	54-80	38-60
BsD-------------- Brenham	0-10	Clay loam--------	CL	A-7-6, A-6	0	100	95-100	85-100	60-100	35-49	17-27
	10-38	Silty clay loam, clay loam, clay.	CL, CH	A-7-6, A-6	0	95-100	95-100	85-100	75-100	39-55	20-33
	38-80	Clay, silty clay	CL, CH	A-7-6	0	95-100	95-100	85-100	80-100	41-65	22-42
BuA-------------- Burleson	0-21	Clay-------------	CH, CL	A-7-6	0-2	90-100	90-100	90-99	67-97	45-57	28-39
	21-42	Clay, silty clay	CH	A-7-6	0-1	90-100	90-100	90-99	80-99	51-72	34-48
	42-80	Clay, silty clay	CH	A-7-6	0-2	90-100	80-100	75-99	67-98	60-84	40-60
BwC-------------- Burlewash	0-4	Fine sandy loam	SM, ML, SC-SM, CL-ML	A-4	0	90-100	90-100	70-95	40-60	<20	NP-7
	4-19	Clay, sandy clay	CL, CH	A-7	0	95-100	95-100	90-100	51-90	41-55	20-30
	19-26	Clay loam, sandy clay loam, clay.	CL	A-6, A-7	0	95-100	95-100	75-95	51-75	35-45	18-25
	26-40	Weathered bedrock	---	---	---	---	---	---	---	---	---
BwE-------------- Burlewash	0-4	Very gravelly fine sandy loam.	GM, SM, GM-GC, SC-SM	A-2-4, A-1-B	0-3	50-65	40-50	30-40	15-25	<20	NP-7
	4-20	Clay, sandy clay	CL, CH	A-7	0	95-100	95-100	90-100	51-90	41-55	20-30
	20-34	Clay loam, sandy clay loam, clay.	CL	A-6, A-7	0	95-100	95-100	75-95	51-75	35-45	18-25
	34-40	Weathered bedrock	---	---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
BwF-------------- Burlewash	0-12	Very gravelly fine sandy loam.	GM, SM, GM-GC, SC-SM	A-2-4, A-1-B	0-3	50-65	40-50	30-40	15-25	<20	NP-7
	12-22	Clay, sandy clay	CL, CH	A-7	0	95-100	95-100	90-100	51-90	41-55	20-30
	22-34	Clay loam, sandy clay loam, clay.	CL	A-6, A-7	0	95-100	95-100	75-95	51-75	35-45	18-25
	34-40	Weathered bedrock	---	---	---	---	---	---	---	---	---
CaB-------------- Cadell	0-5	Very fine sandy loam.	SM, SC-SM, CL-ML, ML	A-4	0-1	90-100	90-100	70-95	40-55	<30	NP-7
	5-24	Clay loam, silty clay, clay.	CL, CH	A-7-6	0-1	90-100	90-100	85-100	50-95	42-60	22-49
	24-43	Clay loam, silty clay loam, clay.	CL	A-6, A-7-6	0-1	90-100	90-100	85-100	55-95	42-60	22-49
	43-80	Stratified clay to clay.	CH	A-7-6	0-1	95-100	95-100	90-100	60-85	60-92	36-60
CbC-------------- Carbengle	0-10	Sandy clay loam	CL, SC	A-6, A-4	0-5	90-100	85-100	70-98	41-80	25-40	8-23
	10-33	Loam, sandy clay loam, clay loam.	CL	A-6, A-4	0-8	85-100	85-100	70-98	51-85	25-40	8-25
	33-40	Weathered bedrock	---	---	---	---	---	---	---	---	---
CbD-------------- Carbengle	0-6	Sandy clay loam	CL	A-6, A-4	0-5	90-100	85-100	70-98	51-80	25-40	8-20
	6-28	Loam, sandy clay loam, clay loam.	CL	A-6, A-4	0-8	85-100	85-100	70-98	51-85	25-40	8-20
	28-48	Weathered bedrock	---	---	---	---	---	---	---	---	---
CbE4:											
Carbengle-------	0-5	Loam-------------	CL	A-6, A-4	0-5	90-100	85-100	70-98	51-80	25-40	8-20
	5-32	Loam, sandy clay loam, clay loam.	CL	A-6, A-4	0-8	85-100	85-100	70-98	51-85	25-40	8-20
	32-47	Weathered bedrock	---	---	---	---	---	---	---	---	---
Gullied land----	0-40	Variable---------	---	---	---	---	---	---	---	---	---
CeC-------------- Carmine	0-14	Extremely gravelly very fine sandy loam.	GP-GM, GM	A-1	0-5	25-40	10-25	10-25	10-15	<25	NP-3
	14-36	Extremely gravelly coarse sand, very gravelly loamy coarse sand.	GP-GM, GW-GM	A-1	5-15	25-50	10-40	5-25	5-10	<25	NP-3
	36-60	Gravelly sandy clay loam, very gravelly sandy clay loam.	SC, GC	A-2-7	0-5	45-70	30-50	25-45	15-25	40-60	20-40
	60-80	Sandy clay loam	CL, CH, SC	A-7, A-6	0-2	90-100	80-100	65-95	35-60	25-55	15-40
ChB-------------- Chazos	0-13	Loamy fine sand	SM, SC-SM	A-2-4, A-4	0	80-100	75-100	60-98	20-50	<25	NP-4
	13-31	Sandy clay, clay	CL, CH	A-7-6	0	90-100	75-100	75-100	55-85	43-58	21-35
	31-60	Clay loam, sandy clay loam.	CL, CH, SC	A-7-6	0	90-100	75-100	65-95	35-75	43-58	21-35
	60-74	Clay loam, silty clay loam, clay, loam, fine sandy loam.	CL, CH	A-7-6, A-6	0	90-100	75-100	70-95	50-85	35-55	15-35

Table 14.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Co---------------- Coarsewood	0-7	Silt loam--------	ML, CL-ML, CL	A-4	0	100	96-100	95-100	64-95	<28	NP-10
	7-45	Very fine sandy loam, loam, silt loam.	ML, CL-ML, CL	A-4	0	100	96-100	95-100	64-95	<28	NP-10
	45-80	Very fine sandy loam, loam, silt loam.	ML, CL-ML, CL	A-4	0	100	96-100	90-100	64-95	<28	NP-10
CrB-------------- Crockett	0-9	Loam-------------	SM, ML, CL, SC	A-4, A-6	0-2	98-100	94-100	89-100	40-96	15-35	3-15
	9-16	Clay, clay loam, sandy clay.	CH, CL	A-7, A-6	0	89-100	75-100	75-100	60-98	35-59	23-42
	16-29	Clay, clay loam, sandy clay.	CH, CL	A-7, A-6	0	89-100	75-100	75-100	65-98	35-59	23-42
	29-47	Clay loam, sandy clay loam, clay.	CL, CH	A-6, A-7	0-5	90-100	85-100	75-100	50-90	30-60	15-40
	47-80	Stratified loam to very shaly clay.	CH, CL	A-7	0-5	90-100	90-100	90-100	70-99	45-71	27-52
Dg--------------- Degola	0-12	Loam-------------	CL, SC	A-6	0	95-100	95-100	80-100	40-80	28-40	11-18
	12-72	Clay loam, sandy clay loam, loam.	CL, SC	A-6	0	95-100	95-100	80-100	40-80	28-40	11-18
DnC-------------- Dubina	0-16	Loamy fine sand	SM, SC-SM, SP-SM	A-2-4, A-3	0	95-100	95-100	75-100	8-35	<25	NP-5
	16-27	Clay loam, sandy clay.	CL, CH, SC	A-7-6	0	95-100	95-100	80-100	35-65	40-65	20-35
	27-70	Sandy clay loam, clay loam, sandy clay.	CL, CH, SC	A-6, A-7, A-4, A-2-4	0	95-100	95-100	75-100	25-55	25-55	7-28
	70-80	Loamy sand, fine sandy loam, sandy clay loam.	SC, CL-ML, SC-SM, CL	A-2-4, A-4, A-6	0	95-100	90-100	75-100	15-55	20-50	5-30
DtB-------------- Dutek	0-18	Loamy fine sand	SM, SP-SM	A-2, A-3	0	95-100	95-100	85-100	9-25	<22	NP-3
	18-26	Fine sand, loamy fine sand, loamy sand.	SM, SP-SM	A-2, A-3	0	95-100	95-100	85-100	9-25	<22	NP-3
	26-49	Sandy clay loam, clay loam, sandy clay.	CL, SC, SC-SM, CL-ML	A-2, A-4, A-6	0	98-100	95-100	90-100	30-55	24-40	6-20
	49-62	Fine sandy loam, sandy clay loam, loam.	SC, SC-SM, CL-ML, CL	A-2, A-4, A-6	0	95-100	95-100	90-100	22-55	20-40	4-20
	62-75	Loamy fine sand, fine sandy loam.	SM, SC-SM, SP-SM	A-2	0	95-100	95-100	85-100	10-35	<25	NP-7
EdD2------------- Edge	0-5	Gravelly fine sandy loam.	SM, SC-SM	A-2-4	0	85-100	50-75	40-60	25-35	<30	NP-7
	5-30	Sandy clay, clay	CH, CL	A-7-6	0	98-100	97-100	90-100	70-98	48-65	29-42
	30-36	Clay loam, sandy clay.	CL	A-6, A-7-6	0	98-100	96-100	90-100	65-96	30-49	14-30
	36-46	Fine sandy loam, sandy clay loam, clay loam.	SC, CL, SC-SM, CL-ML	A-4, A-6, A-7-6	0	95-100	90-100	72-100	48-78	18-45	4-25
	46-64	Stratified fine sandy loam to shaly clay.	SC, CL, CH	A-2-6, A-2-7, A-6, A-7	0	95-100	90-100	72-100	29-80	25-51	11-34

Table 14.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
EfB:											
Elmendorf	0-5	Loam	CL	A-6, A-7	0-2	95-100	90-100	90-100	65-90	30-50	15-28
	5-27	Clay loam, clay	CH, CL	A-7	0-2	95-100	90-100	90-100	70-95	45-65	25-40
	27-80	Clay loam, clay	CH, CL	A-7	0-2	95-100	90-100	90-100	70-95	45-60	25-36
Denhawken	0-7	Clay loam	CL, CH	A-6, A-7	0-2	95-100	90-100	90-100	60-90	35-55	16-33
	7-43	Clay loam, clay	CH, CL	A-7	0-2	95-100	90-100	85-100	60-90	40-60	20-38
	43-62	Clay loam, clay	CH, CL	A-7	0-2	95-100	90-100	85-100	70-95	48-68	25-43
	62-80	Clay loam, clay	CH, CL	A-7	0-2	95-100	90-100	85-100	70-95	48-68	25-43
FaB Flatonia	0-4	Loam	SC, CL, CH	A-6, A-7-6	0	80-100	80-100	75-100	40-70	39-56	21-34
	4-43	Clay, sandy clay, silty clay.	CH, CL	A-7-6	0	95-100	90-100	90-100	50-80	46-64	28-41
	43-55	Clay loam, clay, sandy clay, loam	CH, CL	A-7-6, A-6	0	95-100	90-100	80-100	60-90	35-56	15-34
	55-80	Weathered bedrock	---	---	---	---	---	---	---	---	---
FrB Frelsburg	0-10	Clay	CH	A-7-6	0	95-100	95-100	90-100	85-100	55-90	35-65
	10-39	Clay, silty clay	CH	A-7-6	0	95-100	95-100	90-100	85-100	55-90	35-65
	39-80	Clay, silty clay	CH	A-7-6	0	95-100	95-100	90-100	85-100	55-90	35-65
FrC Frelsburg	0-9	Clay	CH	A-7-6	0	95-100	95-100	90-100	85-100	55-90	35-65
	9-51	Clay, silty clay	CH	A-7-6	0	95-100	95-100	90-100	85-100	55-90	35-65
	51-80	Clay, silty clay	CH	A-7-6	0	95-100	95-100	90-100	85-100	55-90	35-65
FrD Frelsburg	0-8	Clay	CH	A-7-6	0	95-100	95-100	90-100	85-100	55-90	35-65
	8-69	Clay, silty clay	CH	A-7-6	0	95-100	95-100	90-100	85-100	55-90	35-65
	69-80	Clay, silty clay	CH	A-7-6	0	95-100	95-100	90-100	85-100	55-90	35-65
Ga Gad	0-10	Loamy fine sand	SM, SP-SM	A-2, A-3	0	100	98-100	80-100	5-35	---	NP
	10-80	Stratified fine sand to clay loam.	SM, SP-SM	A-2, A-3	0	100	98-100	80-100	5-35	---	NP
Gb Gad	0-11	Loamy fine sand	SM, SP-SM	A-2, A-3	0	100	98-100	80-100	5-35	---	NP
	11-80	Stratified fine sand to clay loam.	SM, SP-SM	A-2, A-3	0	100	98-100	80-100	5-35	---	NP
Gd Gad	0-18	Fine sand	SM, SP-SM	A-2, A-3	0	100	98-100	80-100	5-35	---	NP
	18-80	Stratified fine sand to clay loam.	SM, SP-SM	A-2, A-3	0	100	98-100	80-100	5-35	---	NP
Ge Ganado	0-12	Clay	CH	A-7-6	0	100	95-100	80-100	75-100	51-76	31-50
	12-67	Clay	CH	A-7-6	0	100	95-100	80-100	75-100	51-76	31-50
	67-80	Clay loam, silty clay loam, sandy clay loam, sandy clay.	CH, CL	A-6, A-7-6	0	90-100	90-100	75-95	75-95	38-60	21-41
Gf Ganado	0-31	Clay	CH	A-7-6	0	100	95-100	80-100	75-100	51-76	31-50
	31-59	Clay	CH	A-7-6	0	100	95-100	80-100	75-100	51-76	31-50
	59-80	Clay loam, silty clay loam, sandy clay loam, clay.	CH, CL	A-6, A-7-6	0	90-100	90-100	75-95	75-95	38-60	21-41

Table 14.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
GhA-------------- Gholson	0-14	Fine sandy loam	ML, CL-ML, SC-SM, SM	A-4	0	95-100	90-100	70-90	36-65	<28	NP-7
	14-28	Sandy clay loam, clay loam, loam.	CL, SC	A-6	0	95-100	90-100	80-100	40-75	26-40	11-22
	28-49	Fine sandy loam, loam.	ML, CL-ML, SC-SM, SM	A-4	0	95-100	90-100	90-100	36-70	20-30	2-7
	49-80	Fine sandy loam, loamy fine sand, loamy very fine sand.	SM, SC-SM	A-2, A-4	0	85-100	85-100	80-95	20-50	<26	NP-5
GhB-------------- Gholson	0-13	Fine sandy loam	ML, CL-ML, SC-SM, SM	A-4	0	95-100	90-100	70-90	36-65	<28	NP-7
	13-56	Sandy clay loam, clay loam, loam.	CL, SC	A-6	0	95-100	90-100	80-100	40-75	26-40	11-22
	56-74	Fine sandy loam, loam.	ML, CL-ML, SC-SM, SM	A-4	0	95-100	90-100	90-100	36-70	20-30	2-7
	74-80	Fine sandy loam, loamy fine sand, loamy very fine sand.	SM, SC-SM	A-2, A-4	0	85-100	85-100	80-95	20-50	<26	NP-5
GrB-------------- Gredge	0-6	Fine sandy loam	SM, ML, SC-SM, CL-ML	A-4, A-2-4	0-1	90-100	90-100	75-85	25-55	<31	NP-7
	6-24	Sandy clay, clay	CH, CL	A-7-6	0-1	90-100	85-100	75-100	51-98	45-65	28-42
	24-34	Clay loam, sandy clay loam.	CL, CH, SC	A-7-6, A-6	0-1	90-100	90-100	80-100	51-85	41-60	25-40
	34-51	Clay loam, sandy clay loam.	CL, SC	A-6, A-2-4, A-7-6	0-1	90-100	90-100	80-100	30-80	35-50	15-30
	51-80	Clay loam, sandy clay loam, fine sandy loam.	SC, CL, SM	A-4, A-6, A-2-4	0-3	90-100	90-100	65-100	26-75	22-40	7-20
GvB-------------- Greenvine	0-14	Clay-------------	CH	A-7-6	0	100	95-100	90-100	75-98	55-75	32-50
	14-29	Clay, silty clay	CH	A-7-6	0	100	95-100	90-100	75-98	55-92	32-62
	29-39	Clay, silty clay	CH	A-7-6	0	100	100	90-100	75-98	55-92	32-62
	39-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
GvC-------------- Greenvine	0-13	Clay-------------	CH	A-7-6	0	100	95-100	90-100	75-98	55-75	32-50
	13-21	Clay, silty clay	CH	A-7-6	0	100	95-100	90-100	75-98	55-92	32-62
	21-30	Clay, silty clay	CH	A-7-6	0	100	100	90-100	75-98	55-92	32-62
	30-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
GvD4:											
Greenvine-------	0-8	Clay-------------	CH	A-7-6	0	100	95-100	90-100	75-98	55-75	32-50
	8-16	Clay, silty clay	CH	A-7-6	0	100	95-100	90-100	75-98	55-92	32-62
	16-29	Clay, silty clay	CH	A-7-6	0	100	100	90-100	75-98	55-92	32-62
	29-48	Weathered bedrock	---	---	---	---	---	---	---	---	---
Gullied land----	0-40	Variable---------	---	---	---	---	---	---	---	---	---
HvB-------------- Hallettsville	0-8	Fine sandy loam	CL, SC	A-6, A-4	0	95-100	90-100	75-100	40-70	25-40	8-21
	8-35	Clay loam, sandy clay, clay.	CH, CL	A-7	0	95-100	90-100	80-100	55-85	42-60	25-40
	35-53	Sandy clay loam, clay loam, sandy clay.	CL, CH	A-6, A-7	0	95-100	90-100	75-100	50-80	30-55	13-33
	53-80	Fine sandy loam, sandy clay loam, clay loam.	SC, CL	A-2-4, A-2-6, A-4, A-6	0	95-100	90-100	75-100	25-55	25-38	8-18

Table 14.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
IzA-------------- Inez	0-17	Fine sandy loam	SM, SC-SM	A-2-4, A-4	0	98-100	98-100	90-100	20-49	<25	NP-7
	17-49	Clay, sandy clay	CL, CH	A-7-6, A-6	0	98-100	98-100	90-100	50-75	36-66	21-45
	49-80	Sandy clay, clay loam, sandy clay loam.	CL, CH, SC	A-6, A-7-6	0	98-100	98-100	90-100	49-75	36-55	25-40
JoC-------------- Joiner	0-12	Sand-------------	SM, SP-SM	A-3, A-2-4	0	100	98-100	50-70	5-15	<25	NP-3
	12-45	Sand-------------	SM, SP-SM	A-3, A-2-4	0	100	98-100	50-70	5-15	<25	NP-3
	45-80	Loamy sand-------	SM	A-2-4	0	100	98-100	50-75	15-30	<25	NP-4
KnC-------------- Knolle	0-13	Fine sand--------	SM, SC-SM	A-2-4	0	100	98-100	65-80	25-35	<25	NP-5
	13-35	Sandy clay loam, clay loam, sandy clay.	SC, CL	A-6, A-4, A-7-6	0	100	98-100	85-100	36-65	20-45	7-23
	35-80	Sandy loam, sandy clay loam, loamy sand.	SM, SC-SM, SC	A-2, A-4	0	100	98-100	85-100	30-45	20-27	3-9
KoC-------------- Koether	0-14	Very stony loamy fine sand.	SM, SP-SM	A-2	25-45	80-98	75-95	60-85	10-25	<20	NP-4
	14-20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Kr--------------- Krum	0-7	Silty clay-------	CH, CL	A-7-6	0	95-100	85-100	85-100	85-95	47-65	25-42
	7-65	Silty clay, clay	CH	A-7-6	0	95-100	85-100	80-100	65-95	51-74	28-50
	65-80	Silty clay loam, silty clay, clay.	CH, CL	A-7-6, A-6	0	85-100	75-100	70-99	65-95	36-60	20-39
KuC-------------- Kurten	0-7	Very fine sandy loam.	ML, CL-ML	A-4	0	95-100	95-100	85-95	50-65	15-30	NP-7
	7-32	Clay, silty clay, clay loam.	CH, CL	A-7-6	0-2	95-100	95-100	89-100	65-95	41-59	25-42
	32-48	Clay, silty clay, clay loam.	CH, CL	A-7-6	0-1	95-100	95-100	89-100	65-95	41-59	25-42
	48-80	Clay, clay loam, loam.	CH, CL	A-6, A-7-6	0-1	95-100	95-100	89-100	60-90	35-59	20-40
LaD-------------- Latium	0-8	Clay-------------	CH	A-7-6	0	95-100	90-100	85-100	80-100	55-85	35-60
	8-80	Clay, silty clay	CH	A-7-6	0	95-100	90-100	85-100	80-100	55-85	35-60
LaD3------------- Latium	0-6	Clay-------------	CH	A-7-6	0	95-100	90-100	85-100	80-100	55-85	35-60
	6-65	Clay, silty clay	CH	A-7-6	0	95-100	90-100	85-100	80-100	55-85	35-60
LgD-------------- Latium	0-22	Gravelly clay----	CH	A-7-6	0	95-100	90-100	85-100	80-100	55-85	35-60
	22-60	Clay, silty clay	CH	A-7-6	0	95-100	90-100	85-100	80-100	55-85	35-60
LkA-------------- Lufkin	0-7	Fine sandy loam	SM, CL, ML, SC	A-4	0-5	90-100	80-100	80-100	40-85	<30	NP-10
	7-43	Clay, clay loam, silty clay loam.	CH, CL	A-7-6	0	90-100	90-100	90-100	65-95	45-67	30-45
	43-80	Loam, clay loam, sandy clay loam.	CH, CL, SC	A-7	0	85-100	85-100	80-100	48-90	40-86	25-55

Table 14.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
LuC-------------- Luling	0-16	Clay-------------	CH	A-7-6	0-2	95-100	90-100	80-100	65-98	51-70	30-45
	16-27	Clay, silty clay	CH	A-7-6	0-2	95-100	90-100	80-100	65-98	51-70	30-45
	27-53	Clay, silty clay	CH	A-7-6	0-2	95-100	90-100	80-100	65-98	51-70	30-45
	53-72	Shaly clay, shaly silty clay.	CH	A-7-6	0-2	95-100	90-100	80-100	65-98	51-70	30-45
Na--------------- Navidad	0-31	Fine sandy loam	SC, SC-SM	A-4, A-6, A-2-4	0	100	100	95-100	15-45	21-30	4-11
	31-59	Fine sand, loamy fine sand, fine sandy loam.	SM, SC-SM	A-2-4	0	95-100	95-100	70-100	15-35	<25	NP-5
	59-80	Fine sandy loam, sandy clay loam, loam.	SC, CL, SC-SM, CL-ML	A-4, A-6, A-2-4	0	100	90-100	75-100	21-51	21-40	4-20
Nd--------------- Navidad	0-39	Fine sandy loam	SC, SC-SM	A-4, A-6, A-2-4	0	100	100	95-100	15-45	21-30	4-11
	39-45	Fine sand, loamy fine sand, fine sandy loam.	SM, SC-SM	A-2-4	0	95-100	95-100	70-100	15-35	<25	NP-5
	45-80	Fine sandy loam, sandy clay loam.	SC, CL, SC-SM, CL-ML	A-4, A-6, A-2-4	0	100	90-100	75-100	21-51	21-40	4-20
NmC-------------- Normangee	0-7	Clay loam--------	CL	A-6, A-7	0	98-100	96-100	90-100	65-95	30-48	11-27
	7-50	Clay, clay loam	CL, CH	A-7	0	98-100	98-100	90-100	65-96	44-80	22-58
	50-65	Stratified shaly clay.	CL, CH	A-7	0	95-100	90-100	90-100	65-94	41-81	20-58
PaC-------------- Padina	0-6	Fine sand--------	SM, SP-SM, SC-SM	A-2-4, A-3	0	100	95-100	65-80	8-28	<25	NP-5
	6-58	Fine sand, loamy fine sand.	SM, SP-SM, SC-SM	A-2-4, A-3	0	100	95-100	85-100	8-28	<25	NP-5
	58-80	Sandy clay loam, fine sandy loam.	SC, CL	A-2, A-4, A-6, A-7	0	90-100	90-100	90-100	25-65	22-42	8-22
PD--------------- Pits and dumps, saline.	0-60	Variable---------	---	---	---	---	---	---	---	---	---
PS--------------- Pits and dumps, sandy.	0-60	Variable---------	---	---	---	---	---	---	---	---	---
Pu--------------- Pursley	0-14	Clay loam--------	CL	A-4, A-6, A-7-6	0	100	95-100	85-100	55-85	25-43	8-25
	14-34	Loam, clay loam	CL	A-4, A-6, A-7-6	0	100	95-100	85-100	55-85	25-43	8-25
	34-80	Stratified loam to silty clay.	CL	A-4, A-6, A-7-6	0	100	95-100	85-100	55-95	25-43	8-25
RbC-------------- Rabbs	0-6	Clay loam--------	CL	A-4, A-6	0-2	85-100	80-100	70-95	55-75	25-40	9-21
	6-38	Loam, clay loam, sandy clay loam.	CL, SC	A-4, A-6	0-2	85-100	80-100	70-95	40-75	25-40	9-21
	38-80	Loam, sandy clay loam.	CL, SC	A-4, A-6	0	85-100	80-100	70-95	40-75	25-40	9-21

Table 14.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
RhB-------------- Rehburg	0-8	Loamy fine sand	SM, SC-SM	A-2-4, A-4	0	95-100	90-100	70-98	20-40	15-25	NP-7
	8-26	Loamy fine sand, fine sand.	SM, SC-SM	A-2-4, A-4	0	95-100	85-100	60-95	15-40	15-25	NP-7
	26-34	Clay, sandy clay, clay loam.	CH, CL, SC	A-7-6, A-6	0	95-100	95-100	80-100	40-95	36-52	17-30
	34-56	Clay loam, loam, sandy clay loam.	CL, SC	A-6, A-7-6	0	95-100	95-100	80-100	35-80	30-44	11-25
	56-65	Weathered bedrock	---	---	---	---	---	---	---	---	---
RkC-------------- Rek	0-3	Extremely gravelly coarse sandy loam.	GM, GP-GM	A-1-A	0-5	20-40	15-35	10-20	5-15	<15	NP-4
	3-7	Gravelly clay, gravelly sandy clay.	CL, CH, SC	A-7-6	0-5	75-90	50-75	50-70	45-65	45-66	28-40
	7-37	Clay, sandy clay	CL, CH	A-7-6	0	85-100	75-100	65-95	50-90	48-71	32-44
	37-63	Sandy clay loam, clay loam, sandy clay.	SC, CL	A-6, A-7-6	0	95-100	75-100	65-90	40-60	28-43	15-26
	63-80	Weathered bedrock	---	---	---	---	---	---	---	---	---
RnC:											
Renish----------	0-12	Fine sandy loam	ML, SM, CL-ML, SC-SM	A-4	0-10	85-100	80-100	80-100	36-60	<25	NP-7
	12-15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop----	0-60	---	---	---	---	---	---	---	---	---	---
RnE:											
Renish----------	0-15	Gravelly fine sandy loam.	SC, CL, CL-ML, SC-SM	A-4, A-6	25-45	80-100	60-80	50-80	35-60	25-40	5-18
	15-18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop----	0-80	---	---	---	---	---	---	---	---	---	---
RoB-------------- Robco	0-8	Fine sand--------	SM, SP-SM	A-2-4, A-3	0	80-100	80-100	65-95	8-35	<25	NP-3
	8-28	Loamy fine sand, fine sand.	SM, SP-SM	A-2-4, A-3	0	80-100	80-100	65-95	8-35	<25	NP-3
	28-35	Sandy clay loam, loam, clay loam.	SC, CL	A-6, A-4	0	98-100	98-100	80-100	36-75	26-40	8-22
	35-49	Clay loam, sandy clay loam.	CL	A-6, A-7	0	98-100	98-100	80-100	50-80	36-50	16-28
	49-74	Sandy clay loam, clay loam, clay.	CL, SC	A-6, A-7	0	98-100	98-100	80-100	40-95	32-50	13-28
RrB-------------- Robco	0-13	Loamy fine sand	SM, SP-SM	A-2-4, A-3	0	80-100	80-100	65-95	8-35	<25	NP-3
	13-23	Loamy fine sand, fine sand.	SM, SP-SM	A-2-4, A-3	0	80-100	80-100	65-95	8-35	<25	NP-3
	23-43	Sandy clay loam, loam, clay loam.	SC, CL	A-6, A-4	0	98-100	98-100	80-100	36-75	26-40	8-22
	43-64	Clay loam, sandy clay loam.	CL	A-6, A-7	0	98-100	98-100	80-100	50-80	36-50	16-28
	64-72	Sandy clay loam, clay loam, clay.	CL, SC	A-6, A-7	0	98-100	98-100	80-100	40-95	32-50	13-28

Table 14.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Rt--------------- Roetex	0-11	Clay-------------	CH, CL	A-7	0	100	100	95-100	90-100	48-70	35-50
	11-41	Clay-------------	CH, CL	A-7	0	100	98-100	95-100	90-100	48-66	35-50
	41-72	Clay, silty clay, clay loam.	CH, CL	A-6, A-7	0	100	98-100	95-100	75-100	38-66	25-50
RvA-------------- Rutersville	0-14	Loamy fine sand	SM, SC-SM, ML, CL-ML	A-2-4, A-4	0-1	90-100	90-100	60-90	25-60	<25	NP-5
	14-24	Sandy clay loam, sandy clay, clay loam.	CL, SC, CH	A-7-6	0-1	90-100	90-100	75-100	45-65	41-65	25-40
	24-34	Fine sandy loam, loam, sandy clay loam.	SC, CL, CH	A-6, A-7-6	0-1	95-100	95-100	75-100	45-70	30-55	15-33
	34-54	Sandy loam, fine sandy loam, loam.	SC, CL, CH	A-6, A-7-6	0-1	95-100	95-100	75-100	25-70	20-55	10-33
	54-79	Weathered bedrock	---	---	---	---	---	---	---	---	---
ScC-------------- Schulenburg	0-13	Sandy clay loam	SC, SC-SM	A-4, A-6, A-2, A-2-6	0	95-100	80-100	65-85	30-50	22-35	6-15
	13-36	Sandy clay loam, clay loam.	CL, SC	A-6, A-7	0	95-100	80-100	65-95	40-75	30-45	11-22
	36-57	Sandy clay loam, clay loam.	CL, SC	A-6, A-7	0	95-100	80-100	65-95	40-75	30-45	11-22
	57-80	Very fine sandy loam.	SC-SM, SM, ML, CL-ML	A-4	0	85-100	75-100	70-90	45-55	<25	NP-7
ShC-------------- Shalba	0-5	Fine sandy loam	SC-SM, SM, CL-ML, ML	A-4	0	95-100	95-100	70-98	40-60	<20	NP-7
	5-16	Clay-------------	CH	A-7, A-2-6, A-7-6	0	95-100	95-100	90-100	65-95	48-70	30-48
	16-24	Weathered bedrock	---	---	---	---	---	---	---	---	---
ShC2------------- Shalba	0-4	Fine sandy loam	SC-SM, SM, CL-ML, ML	A-4	0	95-100	95-100	70-98	40-60	<20	NP-7
	4-18	Clay-------------	CH	A-7	0	95-100	95-100	90-100	65-95	48-70	30-48
	18-24	Weathered bedrock	---	---	---	---	---	---	---	---	---
ShD4:											
Shalba----------	0-2	Fine sandy loam	SC-SM, SM, CL-ML, ML	A-4	0	95-100	95-100	70-98	40-60	<20	NP-7
	2-14	Clay-------------	CH	A-7	0	95-100	95-100	90-100	65-95	48-70	30-48
	14-24	Weathered bedrock	---	---	---	---	---	---	---	---	---
Gullied land----	0-40	Variable---------	---	---	---	---	---	---	---	---	---
Sp--------------- Ships	0-5	Clay-------------	CH	A-7-6	0	100	100	95-100	95-100	55-75	35-50
	5-58	Clay-------------	CH	A-7-6	0	100	100	95-100	95-100	55-75	35-50
	58-80	Clay, silty clay, silty clay loam.	CH	A-7-6	0	100	100	95-100	85-100	51-70	32-50
SrB-------------- Shiro	0-12	Loamy fine sand	SM, SC-SM	A-2-4, A-4	0	95-100	95-100	60-95	15-40	<25	NP-7
	12-20	Clay, sandy clay, clay loam.	CL, CH	A-7-6	0	95-100	95-100	85-100	51-95	45-65	23-38
	20-38	Clay, sandy clay, clay loam.	CL, CH, SC	A-7-6	0	95-100	95-100	75-100	40-70	45-65	25-38
	38-65	Weathered bedrock	---	---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
StB-------------- Singleton	0-7	Fine sandy loam	SC-SM, SM, CL-ML, ML	A-4	0	95-100	90-100	70-95	40-60	<25	NP-7
	7-17	Clay-------------	CH, CL	A-7-6	0	95-100	90-100	90-100	60-95	40-70	25-48
	17-24	Clay, clay loam, sandy clay.	CH, CL	A-7-6	0	95-100	90-100	85-100	51-95	40-60	23-36
	24-33	Clay loam, sandy clay loam.	SC, CL	A-6, A-7-6	0	95-100	90-100	80-100	40-80	35-55	15-36
	33-55	Weathered bedrock	---	---	---	---	---	---	---	---	---
SvA-------------- Smithville	0-12	Fine sandy loam	SC, CL, CL-ML, SC-SM	A-2-4, A-4	0	95-100	95-100	75-100	25-60	<30	NP-10
	12-21	Loam, fine sandy loam, sandy clay loam.	SC, CL	A-6	0	100	95-100	95-100	36-70	26-40	12-20
	21-49	Sandy clay loam, loam, fine sandy loam.	CL	A-6	0	100	95-100	80-100	51-80	26-40	15-25
	49-75	Fine sandy loam, loam.	SC-SM, CL, SC, CL-ML	A-4, A-6	0	90-100	75-100	60-100	40-70	20-35	7-19
SwC-------------- Straber	0-14	Loamy fine sand	SM, SC-SM	A-2	0-2	95-100	90-100	50-85	15-35	<25	NP-6
	14-24	Clay, sandy clay	CL, CH, SC	A-7	0-2	95-100	90-100	70-100	45-65	45-60	25-40
	24-59	Clay, sandy clay, clay loam.	CL, CH, SC	A-7	0-2	95-100	90-100	70-100	45-85	45-60	25-40
	59-80	Clay loam, sandy clay loam, sandy clay.	CL, CH, SC	A-6, A-7, A-2	0	90-100	85-100	75-100	29-70	35-55	15-35
SxC-------------- Straber	0-12	Gravelly loamy fine sand.	SM, SC-SM	A-2-4, A-1-B	0	65-80	50-75	35-50	20-35	<25	NP-6
	12-40	Clay, sandy clay	CL, CH, SC	A-7	0-2	95-100	90-100	70-100	45-65	45-60	25-40
	40-49	Clay, sandy clay, clay loam.	CL, CH, SC	A-7	0-2	95-100	90-100	70-100	45-85	45-60	25-40
	49-72	Clay loam, sandy clay loam, sandy clay.	CL, CH, SC	A-6, A-7, A-2	0	90-100	85-100	75-100	29-70	35-55	15-35
SxD-------------- Straber	0-4	Gravelly loamy fine sand.	SM, SC-SM	A-2-4, A-1-B	0	65-80	50-75	35-50	20-35	<25	NP-6
	4-9	Clay, sandy clay	CL, CH, SC	A-7	0-2	95-100	90-100	70-100	45-65	45-60	25-40
	9-50	Clay, sandy clay, clay loam.	CL, CH, SC	A-7	0-2	95-100	90-100	70-100	45-85	45-60	25-40
	50-60	Clay loam, sandy clay loam, sandy clay.	CL, CH, SC	A-6, A-7, A-2	0	90-100	85-100	75-100	29-70	35-55	15-35
TrB-------------- Tremona	0-26	Loamy sand-------	SM, SP-SM	A-2-4, A-3	0	80-100	80-100	60-100	8-35	<25	NP-3
	26-54	Sandy clay, clay	SC, CL, CH	A-7	0	80-100	80-100	75-100	36-85	40-60	20-40
	54-80	Sandy clay loam, sandy clay, clay loam.	SC, CL, CH	A-7, A-6, A-2-7, A-2-6	0	80-100	80-100	70-100	30-85	30-60	15-40
Tw--------------- Trinity	0-5	Clay-------------	CH	A-7-6	0	100	98-100	85-100	80-100	55-85	35-60
	5-67	Clay-------------	CH	A-7-6	0	100	95-100	85-100	80-100	55-85	35-60
	67-80	Clay-------------	CH	A-7-6	0	100	95-100	85-100	80-100	55-85	35-60

Table 14.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Uf-------------- Uhland	0-6	Clay loam--------	CL	A-6, A-7	0	97-100	97-100	90-100	55-90	30-45	12-25
	6-80	Stratified fine sandy loam to loam.	CL, SC, ML, SM	A-4, A-6	0	97-100	95-100	80-100	36-78	18-36	3-18
US-------------- Ustorthents, sandy	0-80	Coarse sand,----- sand, fine sand	SW, SP, SP-SM, SM	A-1-B, A-2-4, A-3	0-2	95-100	90-100	45-80	2-35	<25	NP-3
Wa-------------- Warda	0-15	Very fine sandy loam.	ML, CL-ML, CL	A-4	0	95-100	85-100	75-90	50-55	16-28	NP-10
	15-38	Sandy clay loam, loam, clay loam.	CL, SC	A-6	0	95-100	80-100	70-90	40-75	25-40	12-25
	38-56	Sandy clay loam, loam.	CL, SC	A-6	0	95-100	80-100	70-90	40-65	25-40	12-25
	56-80	Fine sandy loam, loam.	CL, SC	A-6, A-4	0	95-100	80-100	65-90	40-65	20-40	8-20
We-------------- Weswood	0-17	Loam-------------	CL, CL-ML	A-4, A-6	0	100	98-100	90-100	65-95	20-35	5-18
	17-80	Silt loam, silty clay loam, clay loam.	CL, CL-ML	A-4, A-6	0	100	98-100	95-100	70-98	20-40	5-22
WsA------------- Wilson	0-10	Clay loam--------	CL	A-6, A-7-6	0	95-100	85-100	80-100	60-96	38-49	20-30
	10-51	Silty clay, clay, clay loam.	CL, CH	A-7-6	0	90-100	80-100	80-100	65-96	43-56	26-37
	51-80	Silty clay, clay, silty clay loam.	CL, CH	A-7-6, A-6	0	95-100	90-100	85-100	70-96	38-65	24-48
WwC------------- Winedale	0-7	Gravelly fine sandy loam.	SC, SC-SM, SM	A-4, A-2-4, A-2-6	0-2	85-100	50-75	40-70	25-45	<29	NP-12
	7-37	Clay-------------	CH	A-7	0	100	95-100	90-100	80-95	76-85	49-55
	37-62	Clay-------------	CH	A-7	0	100	95-100	90-100	80-95	76-85	49-55
ZkB------------- Zack	0-6	Very fine sandy loam.	SM, SC-SM, ML, CL-ML	A-4	0-1	90-100	90-100	70-95	40-65	20-30	NP-7
	6-14	Clay-------------	CH	A-7-6	0-1	90-100	90-100	90-100	65-95	42-70	25-45
	14-24	Clay, clay loam	CH, CL	A-7-6	0-1	90-100	90-100	90-100	65-95	42-60	25-38
	24-38	Clay loam, silty clay loam, sandy clay loam.	CL	A-6, A-7-6	0-1	90-100	90-100	80-95	51-90	30-42	11-20
	38-72	Loam, clay loam, silty clay loam.	CL	A-4, A-6	0-1	90-100	90-100	80-100	51-90	26-40	8-20
ZkC------------- Zack	0-10	Gravelly fine sandy loam.	SM, SC-SM	A-2-4	0-1	85-100	50-75	40-60	25-35	<30	NP-7
	10-22	Clay-------------	CH	A-7-6	0-1	90-100	90-100	90-100	75-95	42-70	25-45
	22-28	Clay, clay loam	CH, CL	A-7-6	0-1	90-100	90-100	90-100	70-95	42-60	25-38
	28-38	Clay loam, silty clay loam, sandy clay loam.	CL	A-6, A-7-6	0-1	90-100	90-100	80-95	51-90	30-42	11-20
	38-72	Loam, clay loam, silty clay loam.	CL	A-4, A-6	0-1	90-100	90-100	80-100	51-90	26-40	8-20

Table 14.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
ZuA--------------	0-5	Fine sandy loam	SM, ML	A-4	0	95-100	95-100	70-100	40-60	<30	NP-7
Zulch	5-28	Clay loam, clay, silty clay.	CH, CL	A-7-6	0	95-100	95-100	90-100	65-95	41-60	20-35
	28-39	Clay, silty clay, clay loam.	CH, CL	A-7-6	0	95-100	95-100	90-100	65-95	41-60	20-38
	39-58	Shaly clay, clay, clay loam.	CH, CL	A-6, A-7-6	0	95-100	95-100	90-100	65-90	35-76	18-57

Table 15.--Physical and Chemical Properties of the Soils

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated.)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm					Pct
ArA: Arol	0-5	10-20	1.40-1.60	0.6-2.0	0.11-0.17	5.1-6.5	<2	Low	0.43	2	3	<1
	5-37	35-50	1.25-1.45	<0.06	0.10-0.16	5.1-7.8	2-8	High	0.32			
	37-54	---	---	0.01-0.6	---	---	---	---	----			
Bg: Bergstrom	0-4	12-27	1.30-1.50	0.6-2.0	0.16-0.20	7.9-8.4	<2	Moderate	0.37	5	4L	1-3
	4-18	22-35	1.30-1.50	0.6-2.0	0.16-0.20	7.9-8.4	<2	Moderate	0.37			
	18-56	22-35	1.30-1.50	0.6-2.0	0.16-0.20	7.9-8.4	<2	Moderate	0.37			
	56-80	18-45	1.20-1.50	0.6-2.0	0.16-0.20	7.9-8.4	<2	Moderate	0.37			
BkB: Bleiblerville	0-10	45-60	1.15-1.35	<0.06	0.15-0.18	6.6-8.4	<2	Very high	0.32	5	4	1-4
	10-45	45-60	1.15-1.35	<0.06	0.15-0.18	7.4-8.4	<2	Very high	0.32			
	45-80	45-70	1.15-1.35	<0.06	0.15-0.18	7.4-8.4	2-8	Very high	0.32			
Bo: Bosque	0-28	20-27	1.20-1.40	0.6-2.0	0.15-0.20	7.4-8.4	<2	Low	0.28	5	4L	1-4
	28-58	20-35	1.20-1.40	0.6-2.0	0.15-0.20	7.4-8.4	<2	Low	0.28			
	58-80	20-45	1.20-1.40	0.6-2.0	0.11-0.18	7.9-8.4	<2	Low	0.28			
BrA: Branyon	0-16	40-60	1.15-1.45	<0.06	0.12-0.18	6.6-8.4	0-2	Very high	0.32	5	4	2-4
	16-59	40-60	1.20-1.45	<0.06	0.12-0.18	7.4-8.4	0-4	Very high	0.32			
	59-75	40-60	1.20-1.35	<0.06	0.12-0.18	7.9-8.4	0-4	Very high	0.32			
BsD: Brenham	0-10	25-35	1.30-1.40	0.6-2.0	0.15-0.20	7.9-8.4	<2	Moderate	0.32	5	4L	1-3
	10-38	36-44	1.30-1.40	0.6-2.0	0.12-0.18	7.9-8.4	<2	Moderate	0.32			
	38-80	40-55	1.20-1.35	0.6-2.0	0.12-0.16	7.9-8.4	<2	Moderate	0.32			
BuA: Burleson	0-21	40-60	1.35-1.50	<0.06	0.12-0.18	5.6-8.4	<2	High	0.32	5	4	1-3
	21-42	40-60	1.40-1.55	<0.06	0.12-0.18	6.1-8.4	0-2	High	0.32			
	42-80	40-60	1.40-1.55	<0.06	0.12-0.18	7.4-8.4	0-4	High	0.32			
BwC: Burlewash	0-4	5-15	1.30-1.45	0.6-2.0	0.11-0.15	4.5-6.0	<2	Low	0.43	2	3	<1
	4-19	40-55	1.30-1.45	<0.06	0.12-0.18	3.6-5.5	<2	High	0.28			
	19-26	30-45	1.30-1.45	0.2-0.6	0.12-0.18	4.5-5.5	<2	High	0.32			
	26-40	---	---	---	---	---	---	---	----			
BwE: Burlewash	0-4	10-18	1.30-1.45	0.6-2.0	0.09-0.12	4.5-6.0	<2	Low	0.20	2	5	<1
	4-20	40-55	1.30-1.45	<0.06	0.12-0.18	3.6-5.5	<2	High	0.28			
	20-34	30-45	1.30-1.45	0.2-0.6	0.12-0.18	4.5-5.5	<2	High	0.28			
	34-40	---	---	0.2-2.0	---	---	---	---	----			
BwF: Burlewash	0-12	10-18	1.30-1.45	0.6-2.0	0.09-0.12	4.5-6.0	<2	Low	0.20	2	5	<1
	12-22	40-55	1.30-1.45	<0.06	0.12-0.18	3.6-5.5	<2	High	0.28			
	22-34	30-45	1.30-1.45	0.2-0.6	0.12-0.18	4.5-5.5	<2	High	0.28			
	34-40	---	---	0.2-2.0	---	---	---	---	----			
CaB: Cadell	0-5	7-15	1.15-1.30	0.6-2.0	0.11-0.15	6.1-7.3	<2	Low	0.43	4	3	<2
	5-24	27-50	1.30-1.50	0.06-0.2	0.12-0.20	6.1-7.8	<4	High	0.32			
	24-43	27-45	1.35-1.60	0.06-0.2	0.12-0.18	7.4-8.4	2-8	Moderate	0.32			
	43-80	45-80	1.20-1.70	<0.06	0.10-0.18	7.4-8.4	2-8	Moderate	0.32			
CbC: Carbengle	0-10	20-35	1.40-1.55	0.6-2.0	0.15-0.20	7.9-8.4	<2	Low	0.32	3	4L	1-3
	10-33	20-35	1.40-1.55	0.6-2.0	0.15-0.20	7.9-8.4	<2	Low	0.32			
	33-40	---	---	0.06-2.0	---	---	---	---	----			

Table 15.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm					Pct
CbD-------------	0-6	20-35	1.40-1.55	0.6-2.0	0.15-0.20	7.9-8.4	<2	Low-------	0.32	3	4L	1-3
Carbengle	6-28	20-35	1.40-1.55	0.6-2.0	0.15-0.20	7.9-8.4	<2	Low-------	0.32			
	28-48	---	---	0.06-2.0	---	---	---	----------	----			
CbE4:												
Carbengle-------	0-5	20-35	1.40-1.55	0.6-2.0	0.15-0.20	7.9-8.4	<2	Low-------	0.32	3	4L	1-3
	5-32	20-35	1.40-1.55	0.6-2.0	0.15-0.20	7.9-8.4	<2	Low-------	0.32			
	32-47	---	---	0.06-2.0	---	---	---	----------	----			
Gullied land.												
CeC-------------	0-14	4-10	1.50-1.70	>20	0.01-0.07	4.5-6.5	<2	Low-------	0.15	5	8	<1
Carmine	14-36	2-5	1.50-1.70	>20	0.01-0.07	4.5-6.5	<2	Low-------	0.15			
	36-60	20-35	1.40-1.60	<0.06	0.03-0.08	3.6-5.5	<2	High------	0.28			
	60-80	20-35	1.45-1.65	0.06-0.2	0.10-0.18	3.6-6.5	<2	Moderate	0.32			
ChB-------------	0-13	2-12	1.40-1.60	2.0-6.0	0.06-0.10	5.6-7.3	<2	Low-------	0.20	5	2	<1
Chazos	13-31	35-50	1.35-1.50	0.06-0.2	0.12-0.16	5.6-6.5	<2	Moderate	0.32			
	31-60	20-40	1.35-1.55	0.06-0.2	0.11-0.17	5.6-7.3	<2	Moderate	0.32			
	60-74	27-45	1.40-1.60	0.06-0.2	0.12-0.18	6.1-8.4	<2	Moderate	0.32			
Co--------------	0-7	8-18	1.18-1.40	2.0-6.0	0.11-0.17	7.4-8.4	<2	Low-------	0.43	5	4L	0.5-2
Coarsewood	7-45	8-18	1.18-1.40	2.0-6.0	0.11-0.17	7.4-8.4	<2	Low-------	0.43			
	45-80	6-18	1.18-1.40	2.0-6.0	0.11-0.17	7.4-8.4	<2	Low-------	0.43			
CrB-------------	0-9	5-20	1.50-1.60	0.6-2.0	0.11-0.20	5.6-7.8	<2	Low-------	0.43	5	5	0.5-2
Crockett	9-16	40-55	1.35-1.60	<0.06	0.08-0.14	5.6-7.3	<4	High------	0.32			
	16-29	35-55	1.40-1.65	<0.06	0.08-0.14	6.1-8.4	<4	High------	0.32			
	29-47	20-50	1.50-1.70	<0.06	0.11-0.15	6.1-8.4	<4	Moderate	0.32			
	47-80	30-60	1.50-1.70	<0.06	0.11-0.15	6.1-8.4	<4	High------	0.32			
Dg--------------	0-12	18-35	1.30-1.50	0.6-2.0	0.12-0.20	6.1-7.8	<2	Low-------	0.32	5	5	1-3
Degola	12-72	18-35	1.40-1.55	0.6-2.0	0.12-0.20	6.6-8.4	<2	Low-------	0.32			
DnC-------------	0-16	5-12	1.55-1.69	2.0-6.0	0.07-0.11	5.6-7.3	<2	Low-------	0.24	5	2	1-3
Dubina	16-27	35-45	1.35-1.60	0.06-0.2	0.12-0.17	5.6-7.8	<2	High------	0.32			
	27-70	20-40	1.40-1.69	0.06-0.2	0.11-0.16	5.6-8.4	<2	Moderate	0.32			
	70-80	10-35	1.50-1.70	0.2-2.0	0.08-0.14	6.1-8.4	<2	Moderate	0.37			
DtB-------------	0-18	3-12	1.30-1.60	6.0-20	0.05-0.10	5.6-7.3	<2	Low-------	0.20	5	2	<1
Dutek	18-26	3-12	1.30-1.60	6.0-20	0.05-0.10	5.6-7.3	<2	Low-------	0.20			
	26-49	18-35	1.30-1.65	0.6-2.0	0.12-0.17	4.5-6.5	<2	Low-------	0.24			
	49-62	10-30	1.30-1.65	0.6-6.0	0.10-0.16	4.5-6.5	<2	Low-------	0.24			
	62-75	5-20	1.30-1.60	2.0-20	0.05-0.10	4.5-6.5	<2	Low-------	0.20			
EdD2------------	0-5	5-12	1.25-1.55	0.6-2.0	0.10-0.14	4.5-7.3	<2	Low-------	0.20	5	8	<1
Edge	5-30	40-55	1.36-1.55	<0.06	0.11-0.19	4.5-6.5	<2	High------	0.32			
	30-36	27-45	1.45-1.65	0.06-0.2	0.10-0.16	4.5-6.5	<2	Moderate	0.32			
	36-46	10-40	1.40-1.69	0.2-0.6	0.10-0.16	4.5-7.8	<2	Moderate	0.37			
	46-64	10-45	1.50-1.75	0.06-0.2	0.11-0.18	5.1-8.4	<2	Moderate	0.37			
EfB:												
Elmendorf-------	0-5	20-34	1.35-1.55	0.2-0.6	0.15-0.20	6.1-8.4	<2	Moderate	0.32	5	6	1-3
	5-27	35-50	1.30-1.60	<0.06	0.15-0.20	6.6-8.4	<2	High------	0.32			
	27-80	30-45	1.30-1.60	<0.06	0.04-0.18	7.4-8.4	2-16	High------	0.32			

Table 15.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm					Pct
Denhawken-------	0-7	30-45	1.20-1.50	0.2-0.6	0.13-0.18	7.4-8.4	<2	Moderate	0.32	5	6	1-3
	7-43	35-50	1.25-1.50	<0.06	0.14-0.18	7.4-8.4	<2	High------	0.32			
	43-62	35-55	1.35-1.60	<0.06	0.14-0.18	7.4-8.4	<4	High------	0.32			
	62-80	35-50	1.35-1.60	<0.06	0.04-0.15	7.4-8.4	2-16	High------	0.32			
FaB-------------- Flatonia	0-4	14-35	1.40-1.65	0.2-0.6	0.12-0.19	6.1-8.4	<2	Moderate	0.32	4	6	1-4
	4-43	40-50	1.40-1.70	0.06-0.2	0.08-0.14	6.1-8.4	<2	High------	0.32			
	43-55	25-40	1.40-1.70	0.06-0.2	0.08-0.14	7.4-8.4	<2	Moderate	0.37			
	55-80	---	---	0.01-0.6	---	---	---	----------	----			
FrB-------------- Frelsburg	0-10	45-60	1.25-1.45	<0.06	0.15-0.20	7.4-8.4	<2	Very high	0.32	5	4	1-4
	10-39	45-60	1.30-1.50	<0.06	0.14-0.19	7.9-8.4	<2	Very high	0.32			
	39-80	45-60	1.30-1.50	<0.06	0.14-0.19	7.9-8.4	<4	Very high	0.32			
FrC-------------- Frelsburg	0-9	45-60	1.25-1.45	<0.06	0.15-0.20	7.4-8.4	<2	Very high	0.32	5	4	1-4
	9-51	45-60	1.30-1.50	<0.06	0.14-0.19	7.9-8.4	<2	Very high	0.32			
	51-80	45-60	1.30-1.50	<0.06	0.14-0.19	7.9-8.4	<4	Very high	0.32			
FrD-------------- Frelsburg	0-8	45-60	1.25-1.45	<0.06	0.15-0.20	7.4-8.4	<2	Very high	0.32	5	4	1-4
	8-69	45-60	1.30-1.50	<0.06	0.14-0.19	7.9-8.4	<2	Very high	0.32			
	69-80	45-60	1.30-1.50	<0.06	0.14-0.19	7.9-8.4	<4	Very high	0.32			
Ga--------------- Gad	0-10	5-15	1.35-1.50	6.0-20	0.07-0.11	7.4-8.4	<2	Low-------	0.17	5	2	<0.5
	10-80	5-15	1.50-1.70	6.0-20	0.06-0.10	7.9-8.4	<2	Low-------	0.17			
Gb--------------- Gad	0-11	5-15	1.35-1.50	6.0-20	0.07-0.11	7.4-8.4	<2	Low-------	0.17	5	2	<0.5
	11-80	5-15	1.50-1.70	6.0-20	0.06-0.10	7.9-8.4	<2	Low-------	0.17			
Gd--------------- Gad	0-18	5-15	1.35-1.50	6.0-20	0.07-0.11	7.4-8.4	<2	Low-------	0.17	5	2	<0.5
	18-80	5-15	1.50-1.70	6.0-20	0.06-0.10	7.9-8.4	<2	Low-------	0.17			
Ge--------------- Ganado	0-12	40-60	1.20-1.45	<0.06	0.13-0.17	6.6-8.4	<2	High------	0.32	5	4	2-5
	12-67	40-60	1.20-1.45	<0.06	0.13-0.17	6.6-8.4	<2	Very high	0.32			
	67-80	30-50	1.30-1.50	0.06-0.2	0.13-0.16	7.9-8.4	<2	Moderate	0.32			
Gf--------------- Ganado	0-31	40-60	1.20-1.45	<0.06	0.13-0.17	6.6-8.4	<2	High------	0.32	5	4	2-5
	31-59	40-60	1.20-1.45	<0.06	0.13-0.17	6.6-8.4	<2	Very high	0.32			
	59-80	30-50	1.30-1.50	0.06-0.2	0.13-0.16	7.9-8.4	<2	Moderate	0.32			
GhA-------------- Gholson	0-14	5-20	1.35-1.55	2.0-6.0	0.11-0.17	5.6-7.3	<2	Low-------	0.37	5	3	<2
	14-28	20-35	1.50-1.65	0.6-2.0	0.15-0.19	6.1-7.8	<2	Low-------	0.37			
	28-49	5-20	1.50-1.65	2.0-6.0	0.12-0.16	6.6-8.4	<2	Low-------	0.37			
	49-80	5-20	1.50-1.65	2.0-6.0	0.07-0.15	6.6-8.4	<2	Low-------	0.32			
GhB-------------- Gholson	0-13	5-20	1.35-1.55	2.0-6.0	0.11-0.17	5.6-7.3	<2	Low-------	0.37	5	3	<2
	13-56	20-35	1.50-1.65	0.6-2.0	0.15-0.19	6.1-7.8	<2	Low-------	0.37			
	56-74	5-20	1.50-1.65	2.0-6.0	0.12-0.16	6.6-8.4	<2	Low-------	0.37			
	74-80	5-20	1.50-1.65	2.0-6.0	0.07-0.15	6.6-8.4	<2	Low-------	0.32			
GrB-------------- Gredge	0-6	7-15	1.30-1.55	0.6-2.0	0.11-0.15	4.5-6.5	<2	Low-------	0.43	5	3	<1
	6-24	40-55	1.30-1.50	<0.06	0.13-0.18	4.5-6.5	<2	High------	0.37			
	24-34	20-40	1.35-1.55	0.06-0.2	0.13-0.18	5.1-7.8	<2	Moderate	0.37			
	34-51	20-35	1.40-1.60	0.2-0.6	0.13-0.18	5.6-8.4	<2	Moderate	0.37			
	51-80	15-35	1.30-1.60	0.2-0.6	0.07-0.18	5.6-8.4	<2	Moderate	0.37			
GvB-------------- Greenvine	0-14	40-60	1.10-1.30	<0.06	0.12-0.18	5.1-8.4	<2	Very high	0.32	3	4	1-4
	14-29	40-60	1.20-1.40	<0.06	0.12-0.18	5.1-8.4	<2	Very high	0.32			
	29-39	40-60	1.20-1.40	<0.06	0.12-0.18	6.6-8.4	<4	Very high	0.32			
	39-60	---	---	0.01-0.6	---	---	---	----------	----			

Table 15.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm					Pct
GvC--------------	0-13	40-60	1.10-1.30	<0.06	0.12-0.18	5.1-8.4	<2	Very high	0.32	3	4	1-4
Greenvine	13-21	40-60	1.20-1.40	<0.06	0.12-0.18	5.1-8.4	<2	Very high	0.32			
	21-30	40-60	1.20-1.40	<0.06	0.12-0.18	6.6-8.4	<4	Very high	0.32			
	30-60	---	---	0.01-0.6	---	---	---	----------	----			
GvD4:												
Greenvine-------	0-8	40-60	1.10-1.30	<0.06	0.12-0.18	5.1-8.4	<2	Very high	0.32	3	4	1-4
	8-16	40-60	1.20-1.40	<0.06	0.12-0.18	5.1-8.4	<2	Very high	0.32			
	16-29	40-60	1.20-1.40	<0.06	0.12-0.18	6.6-8.4	<4	Very high	0.32			
	29-48	---	---	0.01-0.6	---	---	---	----------	----			
GvD4:												
Gullied land.												
HvB--------------	0-8	12-25	1.40-1.60	0.2-0.6	0.12-0.17	5.6-7.3	<2	Moderate	0.37	5	3	1-3
Hallettsville	8-35	35-50	1.30-1.60	<0.06	0.12-0.18	5.6-7.3	<2	High------	0.32			
	35-53	20-45	1.30-1.60	0.06-0.2	0.08-0.14	7.4-8.4	<4	High------	0.32			
	53-80	10-35	1.50-1.69	0.06-0.2	0.08-0.14	6.6-8.4	<4	Moderate	0.32			
IzA--------------	0-17	6-18	1.40-1.65	0.6-2.0	0.09-0.13	5.6-7.3	<2	Low-------	0.37	5	3	1-2
Inez	17-49	35-55	1.25-1.45	<0.06	0.14-0.19	4.5-7.3	<2	High------	0.32			
	49-80	25-40	1.30-1.50	0.06-0.2	0.14-0.19	6.6-8.4	<2	Moderate	0.32			
JoC--------------	0-12	1-3	1.35-1.50	6.0-20	0.05-0.08	3.6-6.5	<2	Low-------	0.15	5	1	0.5-2
Joiner	12-45	1-3	1.35-1.50	6.0-20	0.05-0.08	3.6-6.5	<2	Low-------	0.15			
	45-80	5-10	1.35-1.50	6.0-20	0.08-0.11	3.6-6.5	<2	Low-------	0.17			
KnC--------------	0-13	2-7	1.30-1.60	6.0-20	0.05-0.10	5.6-7.3	<2	Low-------	0.28	5	1	0.5-1
Knolle	13-35	18-40	1.35-1.65	0.6-2.0	0.12-0.17	5.1-7.3	<2	Low-------	0.32			
	35-80	10-25	1.35-1.65	2.0-6.0	0.07-0.14	5.1-6.5	<2	Low-------	0.32			
KoC--------------	0-14	5-10	1.30-1.65	6.0-20	0.04-0.09	4.5-6.0	<2	Low-------	0.05	1	8	<1
Koether	14-20	---	---	0.01-0.6	---	---	---	----------	----			
Kr---------------	0-7	35-55	1.35-1.55	0.2-0.6	0.15-0.20	7.4-8.4	<2	High------	0.32	5	4	1-3
Krum	7-65	40-60	1.25-1.50	0.2-0.6	0.08-0.17	7.9-8.4	<2	High------	0.32			
	65-80	35-60	1.30-1.55	0.2-0.6	0.07-0.18	7.9-8.4	<2	High------	0.32			
KuC--------------	0-7	3-7	1.45-1.60	0.6-2.0	0.12-0.16	5.1-7.3	<2	Low-------	0.43	5	3	<1
Kurten	7-32	40-60	1.35-1.50	<0.06	0.14-0.18	4.5-7.3	<2	High------	0.37			
	32-48	40-65	1.35-1.50	<0.06	0.14-0.18	4.5-7.8	<2	High------	0.37			
	48-80	30-55	1.35-1.50	<0.06	0.13-0.18	4.5-7.8	<2	High------	0.37			
LaD--------------	0-8	45-60	1.25-1.45	<0.06	0.15-0.18	7.4-8.4	<2	Very high	0.32	4	4	0.5-2
Latium	8-80	45-60	1.25-1.45	<0.06	0.15-0.18	7.4-8.4	<2	Very high	0.32			
LaD3-------------	0-6	45-60	1.25-1.45	<0.06	0.15-0.18	7.4-8.4	<2	Very high	0.32	4	4	0.5-2
Latium	6-65	45-60	1.25-1.45	<0.06	0.15-0.18	7.4-8.4	<2	Very high	0.32			
LgD--------------	0-22	45-60	1.25-1.45	<0.06	0.15-0.18	7.4-8.4	<2	Very high	0.32	4	4	0.5-2
Latium	22-60	45-60	1.25-1.45	<0.06	0.15-0.18	7.4-8.4	<2	Very high	0.32			
LkA--------------	0-7	5-18	1.35-1.65	0.6-2.0	0.11-0.18	5.1-6.5	<2	Low-------	0.43	5	3	0.5-2
Lufkin	7-43	35-45	1.40-1.60	<0.06	0.12-0.18	4.5-7.8	<4	Very high	0.32			
	43-80	20-40	1.40-1.68	<0.06	0.10-0.14	6.1-8.4	<4	High------	0.37			
LuC--------------	0-16	40-55	1.20-1.35	<0.06	0.10-0.16	6.6-8.4	<2	High------	0.32	4	4	1-3
Luling	16-27	40-55	1.25-1.40	<0.06	0.10-0.16	6.6-8.4	<2	Very high	0.32			
	27-53	40-55	1.25-1.45	<0.06	0.10-0.16	6.6-8.4	0-2	Very high	0.32			
	53-72	40-55	1.40-1.60	<0.06	0.07-0.12	6.6-8.4	0-4	Very high	0.32			

Table 15.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm					Pct
Na--------------- Navidad	0-31	10-25	1.35-1.50	0.6-2.0	0.11-0.16	6.6-8.4	<2	Low-------	0.32	5	5	1-3
	31-59	4-10	1.45-1.75	2.0-20	0.05-0.11	6.6-8.4	<2	Low-------	0.24			
	59-80	15-30	1.40-1.60	0.6-2.0	0.12-0.17	6.6-8.4	<2	Low-------	0.32			
Nd--------------- Navidad	0-39	10-25	1.35-1.50	0.6-2.0	0.11-0.16	6.6-8.4	<2	Low-------	0.32	5	5	1-3
	39-45	4-10	1.45-1.75	2.0-20	0.05-0.11	6.6-8.4	<2	Low-------	0.24			
	45-80	15-30	1.40-1.60	0.6-2.0	0.12-0.17	6.6-8.4	<2	Low-------	0.32			
NmC-------------- Normangee	0-7	25-35	1.50-1.60	0.06-0.2	0.15-0.20	5.6-7.3	<2	Moderate	0.37	4	6	0.5-2
	7-50	35-55	1.55-1.65	<0.06	0.12-0.18	5.6-8.4	2-8	High------	0.32			
	50-65	35-70	1.60-1.70	<0.06	0.12-0.18	6.1-8.4	2-8	High------	0.32			
PaC-------------- Padina	0-6	2-10	1.20-1.50	6.0-20	0.05-0.08	5.6-7.3	<2	Very low	0.17	5	1	<1
	6-58	2-10	1.20-1.50	6.0-20	0.05-0.08	5.6-7.3	<2	Very low	0.17			
	58-80	18-30	1.40-1.60	0.6-2.0	0.14-0.18	5.1-6.5	<2	Low-------	0.24			
PD--------------- Pits and dumps, saline	---	---	---	---	---	---	---	----------	----	---	---	---
PS--------------- Pits and dumps, sandy	---	---	---	---	---	---	---	----------	----	---	---	---
Pu--------------- Pursley	0-14	18-35	1.20-1.40	0.6-2.0	0.16-0.22	7.4-8.4	<2	Moderate	0.28	5	4L	1-3
	14-34	18-35	1.25-1.45	0.6-2.0	0.15-0.20	7.9-8.4	<2	Moderate	0.28			
	34-80	18-45	1.35-1.55	0.6-2.0	0.15-0.20	7.9-8.4	<2	Moderate	0.28			
RbC-------------- Rabbs	0-6	18-35	1.25-1.45	0.6-2.0	0.15-0.19	7.9-8.4	<2	Low-------	0.28	5	4L	1-2
	6-38	18-35	1.35-1.50	0.6-2.0	0.13-0.17	7.9-8.4	<2	Low-------	----			
	38-80	18-35	1.35-1.50	0.6-2.0	0.13-0.17	7.9-8.4	<2	Low-------	----			
RhB-------------- Rehburg	0-8	4-10	1.35-1.55	6.0-20	0.06-0.10	5.1-7.3	<2	Low-------	0.20	4	2	<1
	8-26	2-10	1.40-1.60	6.0-20	0.05-0.10	5.1-7.3	<2	Low-------	0.20			
	26-34	30-45	1.35-1.60	<0.06	0.10-0.15	4.5-6.5	<2	Moderate	0.37			
	34-56	20-35	1.35-1.65	0.06-0.2	0.10-0.15	4.5-6.5	<2	Moderate	0.37			
	56-65	---	---	---	---	---	---	----------	----			
RkC-------------- Rek	0-3	5-18	1.70-1.80	0.06-2.0	0.06-0.12	3.6-5.5	<2	Low-------	0.10	5	8	<1
	3-7	45-60	1.20-1.35	<0.06	0.12-0.17	3.6-5.5	<2	Moderate	0.15			
	7-37	40-60	1.20-1.35	<0.06	0.12-0.17	3.6-6.5	<2	High------	0.28			
	37-63	20-35	1.50-1.80	0.6-2.0	0.11-0.18	3.6-6.5	<2	Low-------	0.32			
	63-80	---	---	---	---	---	---	----------	----			
RnC:												
Renish----------	0-12	10-20	1.35-1.55	0.6-2.0	0.10-0.14	7.4-8.4	<2	Low-------	0.28	1	3	1-3
	12-15	---	---	---	---	---	---	----------	----			
Rock outcrop.												
RnE:												
Renish----------	0-15	15-35	1.35-1.65	0.6-2.0	0.08-0.14	7.4-8.4	<2	Low-------	0.10	1	8	1-3
	15-18	---	---	---	---	---	---	----------	----			
Rock outcrop----	---	---	---	---	---	---	---	----------	----			

Table 15.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm					Pct
RoB-------------- Robco	0-8	2-10	1.40-1.60	6.0-20	0.04-0.10	5.1-6.5	<2	Low-------	0.24	5	2	<1
	8-28	2-10	1.40-1.60	6.0-20	0.04-0.10	5.1-6.5	<2	Low-------	0.24			
	28-35	27-35	1.50-1.65	0.2-0.6	0.12-0.18	4.5-6.0	<2	Moderate	0.32			
	35-49	20-35	1.55-1.70	0.06-0.2	0.12-0.18	4.5-6.0	<2	High------	0.37			
	49-74	25-45	1.55-1.70	0.06-0.2	0.10-0.18	4.5-7.3	<2	Moderate	0.37			
RrB-------------- Robco	0-13	2-10	1.40-1.60	6.0-20	0.04-0.10	5.1-6.5	<2	Low-------	0.24	5	2	<1
	13-23	2-10	1.40-1.60	6.0-20	0.04-0.10	5.1-6.5	<2	Low-------	0.24			
	23-43	27-35	1.50-1.65	0.2-0.6	0.12-0.18	4.5-6.0	<2	Moderate	0.32			
	43-64	20-35	1.55-1.70	0.06-0.2	0.12-0.18	4.5-6.0	<2	High------	0.37			
	64-72	25-45	1.55-1.70	0.06-0.2	0.10-0.18	4.5-7.3	<2	Moderate	0.37			
Rt--------------- Roetex	0-11	55-72	1.20-1.35	<0.06	0.10-0.16	7.4-8.4	<2	High------	0.32	5	4	1-3
	11-41	60-70	1.20-1.35	<0.06	0.10-0.16	7.4-8.4	<2	High------	0.32			
	41-72	35-60	1.25-1.40	<0.06	0.10-0.16	7.4-8.4	<2	High------	0.32			
RvA-------------- Rutersville	0-14	2-10	1.50-1.70	6.0-20	0.07-0.12	4.5-7.3	<2	Low-------	0.24	5	2	<1
	14-24	27-45	1.50-1.70	0.06-0.2	0.14-0.18	4.5-6.5	<2	High------	0.32			
	24-34	20-35	1.55-1.70	0.06-0.2	0.11-0.17	4.5-6.5	<2	Moderate	0.32			
	34-54	15-25	1.55-1.70	0.06-0.2	0.11-0.17	5.1-7.8	<2	Moderate	0.32			
	54-79	---	---	---	---	---	---	----------	----			
ScC-------------- Schulenburg	0-13	15-27	1.35-1.55	0.6-2.0	0.11-0.19	6.1-7.3	<2	Low-------	0.24	4	5	2-3
	13-36	20-35	1.35-1.55	0.6-2.0	0.15-0.19	6.1-7.3	<2	Moderate	0.28			
	36-57	20-35	1.35-1.55	0.6-2.0	0.15-0.19	7.4-8.4	<2	Moderate	0.28			
	57-80	10-20	1.35-1.55	2.0-6.0	0.11-0.15	7.4-8.4	<2	Low-------	0.32			
ShC-------------- Shalba	0-5	5-15	1.40-1.60	0.6-2.0	0.11-0.15	4.5-6.5	<2	Low-------	0.43	1	3	<1
	5-16	40-60	1.40-1.60	<0.06	0.14-0.18	4.5-6.0	<2	High------	0.32			
	16-24	---	---	0.01-0.6	---	---	---	----------	----			
ShC2------------- Shalba	0-4	5-15	1.40-1.60	0.6-2.0	0.11-0.15	4.5-6.5	<2	Low-------	0.43	1	3	<1
	4-18	40-60	1.40-1.60	<0.06	0.14-0.18	4.5-6.0	<2	High------	0.32			
	18-24	---	---	0.01-0.6	---	---	---	----------	----			
ShD4:												
Shalba----------	0-2	5-15	1.40-1.60	0.6-2.0	0.11-0.15	4.5-6.5	<2	Low-------	0.43	1	3	<1
	2-14	40-60	1.40-1.60	<0.06	0.14-0.18	4.5-6.0	<2	High------	0.32			
	14-24	---	---	0.01-0.6	---	---	---	----------	----			
Gullied land.												
Sp--------------- Ships	0-5	60-80	1.20-1.40	<0.06	0.10-0.15	7.9-8.4	<2	Very high	0.32	5	4	0.5-3
	5-58	60-80	1.20-1.40	<0.06	0.10-0.15	7.9-8.4	<2	Very high	0.32			
	58-80	35-80	1.25-1.50	<0.06	0.10-0.15	7.9-8.4	<2	Very high	0.32			
SrB-------------- Shiro	0-12	5-12	1.35-1.55	2.0-6.0	0.08-0.11	5.1-6.5	<2	Low-------	0.32	2	2	<1
	12-20	35-45	1.30-1.50	0.06-0.2	0.14-0.16	4.5-5.5	<2	High------	0.32			
	20-38	35-45	1.30-1.50	0.06-0.2	0.14-0.16	4.5-7.3	<2	High------	0.32			
	38-65	---	---	0.01-0.6	---	---	---	----------	----			
StB-------------- Singleton	0-7	5-20	1.40-1.70	0.6-2.0	0.11-0.18	5.1-6.0	<2	Low-------	0.43	2	3	<1
	7-17	40-50	1.40-1.60	<0.06	0.12-0.18	4.5-6.0	<2	High------	0.32			
	17-24	35-45	1.35-1.50	<0.06	0.14-0.18	4.5-7.8	<4	High------	0.32			
	24-33	25-45	1.20-1.50	0.06-0.2	0.12-0.18	4.5-8.4	<4	High------	0.32			
	33-55	---	---	0.01-0.6	---	---	---	----------	----			

Table 15.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm					Pct
SvA--------------	0-12	17-26	1.35-1.60	0.6-2.0	0.13-0.18	6.6-7.8	<2	Low-------	0.24	5	3	1-3
Smithville	12-21	17-26	1.35-1.60	0.6-2.0	0.13-0.18	6.6-7.8	<2	Low-------	0.28			
	21-49	18-32	1.30-1.50	0.6-2.0	0.15-0.19	6.6-8.4	<2	Moderate	0.32			
	49-75	15-24	1.35-1.60	0.6-2.0	0.13-0.18	7.9-8.4	<2	Low-------	0.32			
SwC--------------	0-14	5-12	1.50-1.70	2.0-6.0	0.07-0.11	5.1-7.3	<2	Low-------	0.24	5	2	<1
Straber	14-24	35-50	1.35-1.55	<0.06	0.14-0.18	4.5-5.5	<2	High------	0.32			
	24-59	35-50	1.40-1.60	0.06-0.2	0.14-0.18	4.5-6.0	<2	High------	0.32			
	59-80	25-45	1.55-1.80	0.06-0.2	0.11-0.18	4.5-8.4	<4	Moderate	0.37			
SxC--------------	0-12	2-12	1.50-1.70	2.0-6.0	0.05-0.09	5.6-7.3	<2	Low-------	0.17	5	3	<1
Straber	12-40	35-50	1.35-1.55	<0.06	0.14-0.18	4.5-5.5	<2	High------	0.32			
	40-49	35-50	1.40-1.60	0.06-0.2	0.14-0.18	4.5-6.0	<2	High------	0.32			
	49-72	25-45	1.55-1.80	0.06-0.2	0.11-0.18	4.5-8.4	<4	Moderate	0.37			
SxD--------------	0-4	2-12	1.50-1.70	2.0-6.0	0.05-0.09	5.6-7.3	<2	Low-------	0.17	5	3	<1
Straber	4-9	35-50	1.35-1.55	<0.06	0.14-0.18	4.5-5.5	<2	High------	0.32			
	9-50	35-50	1.40-1.60	0.06-0.2	0.14-0.18	4.5-6.0	<2	High------	0.32			
	50-60	25-45	1.55-1.80	0.06-0.2	0.11-0.18	4.5-8.4	<4	Moderate	0.37			
TrB--------------	0-26	2-10	1.50-1.70	6.0-20	0.04-0.10	5.1-6.5	<2	Low-------	0.24	5	2	<1
Tremona	26-54	35-50	1.40-1.65	<0.06	0.12-0.18	4.5-6.0	<2	High------	0.28			
	54-80	25-45	1.40-1.65	<0.06	0.12-0.18	4.5-8.4	<2	High------	0.37			
Tw---------------	0-5	60-80	1.25-1.45	<0.06	0.09-0.14	7.4-8.4	<2	Very high	0.32	5	4	1-4
Trinity	5-67	60-80	1.25-1.45	<0.06	0.09-0.14	7.4-8.4	<2	Very high	0.32			
	67-80	60-80	1.30-1.50	<0.06	0.08-0.14	7.4-8.4	<2	Very high	0.32			
Uf---------------	0-6	28-35	1.25-1.45	0.2-0.6	0.15-0.20	6.1-8.4	<2	Moderate	0.32	5	6	0.5-1
Uhland	6-80	10-18	1.35-1.55	0.2-0.6	0.10-0.14	6.1-8.4	<2	Low-------	0.43			
US---------------	0-80	1-5	1.45-1.75	6.0-20	0.02-0.07	7.4-8.4	<2	Low-------	0.10	5	1	<1
Ustorthents, sandy												
Wa---------------	0-15	10-20	1.35-1.55	2.0-6.0	0.11-0.15	5.1-6.5	<2	Low-------	0.37	5	3	1-2
Warda	15-38	20-35	1.40-1.65	0.6-2.0	0.12-0.25	4.5-6.5	<2	Moderate	0.37			
	38-56	20-30	1.50-1.65	0.6-2.0	0.12-0.20	4.5-7.3	<2	Moderate	0.37			
	56-80	10-20	1.35-1.55	0.6-2.0	0.11-0.20	4.5-7.3	<2	Low-------	0.37			
We---------------	0-17	15-27	1.30-1.50	0.6-2.0	0.15-0.20	7.9-8.4	<2	Low-------	0.43	5	6	1-4
Weswood	17-80	20-35	1.35-1.55	0.6-2.0	0.15-0.22	7.9-8.4	<2	Low-------	0.43			
WsA--------------	0-10	27-35	1.35-1.50	0.2-0.6	0.10-0.17	5.6-7.3	<2	Moderate	0.43	5	6	0.5-2
Wilson	10-51	35-50	1.50-1.60	<0.06	0.12-0.15	5.6-8.4	<2	High------	0.37			
	51-80	35-60	1.50-1.60	<0.06	0.12-0.15	6.6-8.4	<2	High------	0.37			
WwC--------------	0-7	5-15	1.35-1.50	2.0-6.0	0.07-0.10	4.5-6.5	<2	Low-------	0.17	5	8	2-4
Winedale	7-37	60-75	1.30-1.40	<0.06	0.12-0.18	3.6-5.5	0-4	Very high	0.32			
	37-80	60-80	1.30-1.40	<0.06	0.06-0.10	3.6-5.5	4-8	Very high	0.32			
ZkB--------------	0-6	7-15	1.15-1.30	0.6-2.0	0.11-0.15	5.1-6.5	<2	Low-------	0.43	3	3	<1
Zack	6-14	40-60	1.30-1.45	<0.06	0.12-0.18	5.6-7.3	<2	High------	0.37			
	14-24	35-55	1.30-1.50	<0.06	0.12-0.20	5.6-8.4	<2	High------	0.37			
	24-38	20-35	1.35-1.60	0.06-0.2	0.12-0.18	6.6-8.4	<2	Moderate	0.37			
	38-72	15-35	1.35-1.60	0.06-0.2	0.07-0.18	6.6-8.4	<4	Low-------	0.37			

Table 15.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm					Pct
ZkC--------------	0-10	7-15	1.15-1.30	0.6-2.0	0.11-0.15	5.1-6.5	<2	Low-------	0.43	3	8	<1
Zack	10-22	40-60	1.30-1.45	<0.06	0.12-0.18	5.6-7.3	<2	High------	0.37			
	22-28	35-55	1.30-1.50	<0.06	0.12-0.20	5.6-8.4	<2	High------	0.37			
	28-38	20-35	1.35-1.60	0.06-0.2	0.12-0.18	6.6-8.4	<2	Moderate	0.37			
	38-72	15-35	1.35-1.60	0.06-0.2	0.07-0.18	6.6-8.4	<4	Low-------	0.37			
ZuA--------------	0-5	4-12	1.50-1.70	0.6-2.0	0.11-0.15	5.6-7.3	<2	Low-------	0.43	4	3	<2
Zulch	5-28	35-50	1.40-1.60	<0.06	0.13-0.18	5.6-7.8	<2	High------	0.32			
	28-39	35-55	1.40-1.60	<0.06	0.13-0.18	6.1-7.8	<2	High------	0.32			
	39-58	35-50	1.40-1.70	<0.06	0.10-0.18	6.6-8.4	<2	Moderate	0.37			

Table 16.--Soil and Water Features

("Flooding," "water table," and such terms as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated.)

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
ArA: Arol	D	None	---	---	1.5-2.5	Perched	Nov-Feb	20-40	Soft	High	Moderate.
Bg: Bergstrom	B	Rare	---	---	>6.0	---	---	>60	---	Moderate	Low.
BkB: Bleiblerville	D	None	---	---	>6.0	---	---	>60	---	High	Low.
Bo: Bosque	B	Occasional	Brief	Oct-May	>6.0	---	---	>60	---	High	Low.
BrA: Branyon	D	None	---	---	>6.0	---	---	>60	---	High	Low.
BsD: Brenham	C	None	---	---	>6.0	---	---	>60	---	High	Low.
BuA: Burleson	D	None	---	---	>6.0	---	---	>60	---	High	Low.
BwC, BwE, BwF: Burlewash	D	None	---	---	>6.0	---	---	20-40	Soft	High	High.
CaB: Cadell	D	None	---	---	1.5-3.5	Perched	Oct-May	>60	---	High	Low.
CbC, CbD: Carbengle	B	None	---	---	>6.0	---	---	20-40	Soft	Moderate	Low.
CbE4:											
Carbengle	B	None	---	---	>6.0	---	---	20-40	Soft	Moderate	Low.
Gullied land.											
CeC: Carmine	C	None	---	---	2.5-3.5	Perched	Nov-Apr	>60	---	Moderate	High.
ChB: Chazos	C	None	---	---	>6.0	---	---	>60	---	High	High.
Co: Coarsewood	B	Occasional	Very brief	Nov-May	>6.0	---	---	>60	---	Low	Low.
CrB: Crockett	D	None	---	---	>6.0	---	---	>60	---	High	Low.
Dg: Degola	B	Occasional	Brief	Oct-May	>6.0	---	---	>60	---	Moderate	Low.
DnC: Dubina	C	None	---	---	>6.0	---	---	>60	---	High	Low.

Table 16.--Soil and Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In			
DtB---------------Dutek	A	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
EdD2--------------Edge	D	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
EfB:											
Elmendorf--------	D	None--------	---	---	>6.0	---	---	>60	---	High-----	Low.
Denhawken--------	D	None--------	---	---	>6.0	---	---	>60	---	High-----	Low.
FaB---------------Flatonia	D	None--------	---	---	3.5-5.0	Perched	Oct-May	40-60	Soft	High-----	Low.
FrB, FrC, FrD-----Frelsburg	D	None--------	---	---	>6.0	---	---	>60	---	High-----	Low.
Ga----------------Gad	A	Rare--------	---	---	>6.0	---	---	>60	---	Low------	Low.
Gb----------------Gad	A	Occasional	Very brief	Nov-May	>6.0	---	---	>60	---	Low------	Low.
Gd----------------Gad	A	Frequent----	Very brief	Nov-May	>6.0	---	---	>60	---	Low------	Low.
Ge----------------Ganado	D	Occasional	Brief-----	Jan-Dec	>6.0	---	---	>60	---	High-----	Low.
Gf----------------Ganado	D	Frequent----	Brief-----	Jan-Dec	>6.0	---	---	>60	---	High-----	Low.
GhA, GhB----------Gholson	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low.
GrB---------------Gredge	D	None--------	---	---	>6.0	---	---	>60	---	High-----	Low.
GvB, GvC----------Greenvine	D	None--------	---	---	>6.0	---	---	20-60	Soft	High-----	Low.
GvD4:											
Greenvine--------	D	None--------	---	---	>6.0	---	---	20-40	Soft	High-----	Low.
Gullied land.											
HvB---------------Hallettsville	D	None--------	---	---	>6.0	---	---	>60	---	High-----	Low.
IzA---------------Inez	D	None--------	---	---	>6.0	---	---	>60	---	High-----	Low.
JoC---------------Joiner	A	None--------	---	---	3.5-5.0	Apparent	Oct-Feb	>60	---	Low------	Moderate.
KnC---------------Knolle	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
KoC---------------Koether	D	None--------	---	---	>6.0	---	---	7-20	Hard	Low------	High.

Table 16.--Soil and Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In			
Kr: Krum	D	Rare	---	---	>6.0	---	---	>60	---	High	Low.
KuC: Kurten	D	None	---	---	>6.0	---	---	>60	---	High	Moderate.
LaD, LaD3, LgD: Latium	D	None	---	---	>6.0	---	---	>60	---	High	Low.
LkA: Lufkin	D	None	---	---	>6.0	---	---	>60	---	High	Moderate.
LuC: Luling	D	None	---	---	>6.0	---	---	>60	---	High	Low.
Na: Navidad	B	Rare	---	---	>6.0	---	---	>60	---	High	Low.
Nd: Navidad	B	Occasional	Brief	Jan-Dec	>6.0	---	---	>60	---	High	Low.
NmC: Normangee	D	None	---	---	>6.0	---	---	>60	---	High	Low.
PaC: Padina	B	None	---	---	>6.0	---	---	>60	---	High	Moderate.
PD: Pits and dumps, saline.											
PS: Pits and dumps, sandy.											
Pu: Pursley	B	Frequent	Brief	Oct-May	>6.0	---	---	>60	---	Moderate	Low.
RbC: Rabbs	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low.
RhB: Rehburg	C	None	---	---	3.0-4.0	Perched	Dec-Apr	40-60	Soft	High	High.
RkC: Rek	C	None	---	---	2.5-3.5	Perched	Nov-Apr	>60	---	High	High.
RnC, RnE:											
Renish	C	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Low.
Rock outcrop.	---	---	---	---	---	---	---	---	---	---	---
RoB, RrB: Robco	C	None	---	---	1.5-3.5	Perched	Jan-Apr	>60	---	High	High.
Rt: Roetex	D	Frequent	Long to very long.	Nov-May	0.5-2.0	Apparent	Oct-May	>60	---	High	Low.

Table 16.--Soil and Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In			
RvA--------------- Rutersville	C	None--------	---	---	2.5-4.0	Perched	Dec-Apr	40-60	Soft	High-----	High.
ScC--------------- Schulenburg	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Low.
ShC, ShC2--------- Shalba	D	None--------	---	---	1.0-1.5	Perched	Nov-Feb	7-20	Soft	High-----	Moderate.
ShD4:											
Shalba-----------	D	None--------	---	---	1.0-1.5	Perched	Nov-Feb	7-20	Soft	High-----	Moderate.
Gullied land.	---	---	---	---	---	---	---	---	---	---	---
Sp---------------- Ships	D	Occasional	Brief-----	Nov-May	>6.0	---	---	>60	---	High-----	Low.
SrB--------------- Shiro	C	None--------	---	---	>6.0	---	---	20-40	Soft	High-----	Moderate.
StB--------------- Singleton	D	None--------	---	---	>6.0	---	---	20-40	Soft	High-----	Moderate.
SvA--------------- Smithville	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low.
SwC, SxC, SxD----- Straber	C	None--------	---	---	>6.0	---	---	>60	---	High-----	High.
TrB--------------- Tremona	C	None--------	---	---	1.5-3.5	Perched	Nov-Apr	>60	---	High-----	High.
Tw---------------- Trinity	D	Occasional	Brief-----	Dec-May	>6.0	---	---	>60	---	High-----	Low.
Uf---------------- Uhland	B	Frequent----	Brief-----	Oct-May	1.5-3.0	Apparent	Dec-May	>60	---	High-----	Low.
US---------------- Ustorthents, sandy	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low.
Wa---------------- Warda	B	Occasional	Very brief to brief.	Oct-May	3.7-6.0	Apparent	Nov-Apr	>60	---	High-----	Low.
We---------------- Weswood	B	Occasional	Brief-----	Nov-May	>6.0	---	---	>60	---	High-----	Low.
WsA--------------- Wilson	D	None--------	---	---	>6.0	---	---	>60	---	High-----	High.
WwC--------------- Winedale	D	None--------	---	---	>6.0	---	---	>60	---	High-----	High.
ZkB, ZkC---------- Zack	D	None--------	---	---	>6.0	---	---	>60	---	High-----	Low.
ZuA--------------- Zulch	D	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate.

Table 17.--Physical Analyses of Selected Soils

(Dashes indicate the determination was not made)

Soil Name and sample number	Depth	Horizon	Particle-size distribution: Sand: Very Coarse (2.0-1.0 mm)	Coarse (1.0-0.5 mm)	Medium (0.5-0.25 mm)	Fine (0.25-0.1 mm)	Very fine (0.1-0.05 mm)	Total (2.0-0.05 mm)	Silt (0.05-0.002 mm)	Clay (<0.002 mm)	Bulk density field moist	Water content: 1/10 -bar	1/3 -bar	15 -bar
	In		Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	g/cc		Pct(wt)	
Arol:[2,4]	0-4	A1	—	—	—	—	—	49.9	38.0	12.1	—	31.32	13.83	5.81
(S80TX-149-001)	4-7	A2	—	—	—	—	—	52.6	35.7	11.7	—	26.93	12.96	4.53
	7-14	Bt1	—	—	—	—	—	36.1	17.6	46.7	—	55.65	24.63	17.05
	14-30	Bt2	—	—	—	—	—	34.4	23.5	42.1	—	63.46	25.96	18.13
	30-34	Bt3	—	—	—	—	—	29.8	32.3	37.9	—	65.56	25.44	21.08
	34-41	Cr1	—	—	—	—	—	25.9	54.7	19.4	—	65.96	27.94	19.84
	41-66	Cr2	—	—	—	—	—	16.7	76.9	6.4	—	59.48	25.85	16.79
	88-96	Cr3	—	—	—	—	—	13.7	77.1	9.2	—	60.89	27.34	17.98
Cadell:[1,5]	0-5	Ap	0.1	0.2	1.7	30.9	34.8	67.7	21.3	11.0	1.45	—	25.8	—
(S85TX-149-003)	5-14	Bt1	0.0	0.2	1.2	20.7	24.3	46.4	18.3	35.3	1.49	—	25.2	—
	14-18	Bt2	0.1	0.2	1.6	22.5	26.1	50.5	20.2	29.3	1.51	—	25.3	—
	27-42	Btk2	0.6	0.4	1.1	17.5	21.8	41.4	24.9	33.7	1.42	—	30.4	—
	42-54	2Cy	0.3	0.4	1.1	16.8	20.2	38.8	23.6	37.6	1.25	—	37.0	—
	54-80	2C	0.2	0.3	0.2	1.1	3.8	5.6	18.6	75.8	1.11	—	49.2	—
Carmine:[1,3]	0-7	A	1.9	4.1	14.7	31.3	17.2	69.2	27.3	3.5	—	—	—	—
(S90TX-149-002)	7-14	AE	10.7	7.0	12.2	27.3	14.5	71.7	23.1	5.2	—	—	—	—
	14-36	E	22.7	18.8	13.3	20.3	8.0	82.7	14.3	3.0	—	—	—	—
	36-47	2Bt1	4.7	8.0	23.8	27.1	5.2	68.8	3.0	28.2	—	—	—	—
	47-60	2Bt2	7.8	21.8	28.4	14.8	2.8	75.6	2.4	22.0	—	—	—	—
	60-65	3Bt3	0.1	0.3	0.8	8.5	51.2	60.9	7.8	31.3	—	—	—	—
	65-80	3BCt	0.0	0.1	1.3	12.8	50.7	64.9	9.0	26.1	—	—	—	—
Flatonia:[2,3]	0-4	Ap	—	—	—	—	—	46.0	29.7	14.3	—	62.02	26.23	16.98
(S80TX-149-005)	4-14	Bt1	—	—	—	—	—	28.1	30.6	41.3	—	78.58	42.20	29.86
	14-33	Bt2	—	—	—	—	—	23.2	30.9	45.9	—	94.50	48.32	44.97
	33-43	Bt3	—	—	—	—	—	14.5	42.0	43.5	—	75.00	41.73	36.90
	43-55	BcK	—	—	—	—	—	34.2	40.8	25.0	—	64.17	41.85	26.33
	55-80	Cr	—	—	—	—	—	15.1	69.8	15.1	—	49.12	33.86	14.99
Normangee:[1,6]	0-5	Ap	7.1	3.4	1.7	6.0	19.4	37.6	34.6	27.8	1.37	—	27.7	—
(S87TX-149-002)	5-13	Bt1	1.5	1.0	0.6	3.0	13.1	19.2	28.8	52.0	1.39	—	29.5	—
	13-27	Bt2	2.4	1.6	0.8	2.4	12.9	20.1	30.8	49.1	1.51	—	25.4	—
	27-41	Bt3	2.1	1.7	0.8	1.7	10.8	17.1	35.1	47.8	1.55	—	19.4	—
	41-48	BCt	0.9	0.8	0.4	0.8	6.5	9.4	38.2	52.4	1.32	—	32.7	—
	48-57	C1	0.2	0.4	0.2	0.4	1.5	2.7	42.7	54.6	1.29	—	32.0	—
	57-72	C2	0.1	0.3	0.2	0.4	2.3	3.3	33.7	63.0	1.10	—	50.1	—

See footnotes at end of table.

Table 17.--Physical Analyses of Selected Soils--Continued

Soil Name and sample number	Depth	Horizon	Particle-size distribution: Sand: Very Coarse (2.0-1.0 mm)	Coarse (1.0-0.5 mm)	Medium (0.5-0.25 mm)	Fine (0.25-0.1 mm)	Very fine (0.1-0.05 mm)	Total (2.0-0.05 mm)	Silt (0.05-0.002 mm)	Clay (<0.002 mm)	Bulk density field moist	Water content: 1/10 -bar	1/3 -bar	15 -bar
	In		Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	g/cc		Pct(wt)	
Rek:[1,3]	0-3	Ap	21.1	4.9	7.3	29.9	10.9	74.1	13.0	12.9	—	—	—	—
(S83TX-149-001)	3-7	Bt1	11.2	1.9	6.7	13.6	3.4	36.8	7.4	55.8	—	—	50.5	—
	7-12	Bt2	1.6	0.3	1.7	5.0	2.3	10.9	5.0	84.1	—	—	37.9	—
	12-22	Bt3	0.5	0.4	2.6	13.7	5.9	23.1	9.2	67.7	—	—	34.1	—
	22-37	2Bt4	0.2	0.5	9.7	37.9	5.2	53.5	6.0	40.6	—	—	21.8	—
	37-49	2Bt5	0.2	0.5	8.4	40.8	11.5	61.4	6.8	31.8	—	—	23.0	—
	49-63	2Bt6	0.0	0.1	2.6	42.1	16.8	61.6	5.9	32.5	—	—	22.7	—
	63-80	2Cr	1.1	0.7	8.5	58.3	11.3	79.9	9.3	10.8	—	—	9.6	—
Rutersville:[2,7]	0-8	A1	—	—	—	—	—	79.7	17.9	2.4	—	25.48	5.06	1.57
(S80TX-149-003)	8-16	A2	—	—	—	—	—	78.7	18.9	2.4	—	24.10	3.75	0.85
	16-23	Btg1	—	—	—	—	—	53.9	8.6	37.5	—	41.99	25.78	15.16
	23-33	Btg2	—	—	—	—	—	62.7	10.9	26.4	—	34.59	18.38	11.51
	33-43	Btg3	—	—	—	—	—	66.5	14.5	19.0	—	37.06	18.78	9.45
	43-62	Ct1	—	—	—	—	—	50.1	12.1	27.8	—	52.54	25.76	12.68
	62-72	Ct2	—	—	—	—	—	49.0	13.1	37.9	—	66.11	31.07	17.02
	105-111	—	—	—	—	—	—	74.7	8.4	16.9	—	56.59	19.47	9.73
Schulenburg:[1,3]	0-5	A1	0.1	0.8	7.3	33.6	19.0	60.8	17.3	21.9	—	—	26.6	—
(S90TX-149-001)	5-13	A2	0.2	0.6	6.9	30.3	18.5	56.5	15.6	27.9	—	—	30.4	—
	13-19	Bt1	1.2	0.9	5.3	29.6	19.2	56.2	15.1	28.7	—	—	25.1	—
	19-29	Bt2	0.6	0.8	4.3	27.4	21.4	54.5	15.2	30.3	—	—	26.7	—
	29-36	Btk1	1.7	1.6	4.0	23.4	21.1	51.8	17.0	31.2	—	—	26.5	—
	36-42	Btk2	2.9	1.8	3.0	18.4	24.4	50.5	17.1	32.4	—	—	26.8	—
	42-49	Btk3	1.4	1.2	2.2	17.7	30.4	52.9	15.9	31.2	—	—	30.2	—
	49-57	Btk4	1.3	1.3	2.3	20.1	35.2	60.2	15.2	24.6	—	—	28.8	—
	57-80	BCk	0.2	0.6	1.9	23.4	38.8	64.9	16.5	18.6	—	—	—	—
Singleton:[2,8]	0-6	Ap	—	—	—	—	—	66.6	31.0	2.4	—	23.92	6.38	1.57
(S80TX-149-002)	6-9	A	—	—	—	—	—	74.0	22.0	4.0	—	20.83	7.33	1.81
	9-16	Bt1	—	—	—	—	—	43.2	16.8	40.0	—	57.47	35.09	19.93
	16-24	Bt2	—	—	—	—	—	45.3	16.4	38.3	—	66.36	31.11	18.80
	24-34	Bt3	—	—	—	—	—	51.3	18.5	30.2	—	53.69	26.94	17.45
	34-44	Cr1	—	—	—	—	—	62.1	13.7	24.2	—	55.84	25.71	15.53
	44-57	Cr2	—	—	—	—	—	66.9	15.7	17.4	—	57.48	32.16	18.97
	57-64	Cr3	—	—	—	—	—	76.6	8.4	15.0	—	42.14	22.70	12.61
Singleton:[1,9]	0-6	Ap	0.1	0.5	8.5	32.5	22.7	64.3	30.3	5.4	1.55	—	21.9	—
(S80TX-149-005)	6-15	Bt1	0.1	0.4	4.5	16.2	11.0	32.2	20.5	47.3	1.55	—	20.6	—
	15-25	Bt2	0.1	0.4	4.8	17.2	12.1	34.6	27.9	37.5	1.49	—	24.9	—
	25-31	BC	0.6	0.7	3.0	10.2	8.9	23.4	33.2	43.4	1.21	—	37.6	—
	31-47	Cr	0.5	0.7	0.9	2.7	8.1	12.9	54.7	32.4	1.07	—	48.9	—

See footnotes at end of table.

Table 17.--Physical Analyses of Selected Soils--Continued

Soil Name and sample number	Depth	Horizon	Particle-size distribution: Sand: Very Coarse (2.0-1.0 mm)	Coarse (1.0-0.5 mm)	Medium (0.5-0.25 mm)	Fine (0.25-0.1 mm)	Very fine (0.1-0.05 mm)	Total (2.0-0.05 mm)	Silt (0.05-0.002 mm)	Clay (<0.002 mm)	Bulk density field moist	Water content: 1/10 -bar	1/3 -bar	15 -bar
	In		Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	g/cc		Pct(wt)	
Winedale:[1,3]	0-4	A1	1.0	1.3	3.6	28.9	29.1	63.9	9.8	11.08	—	—	—	—
(S90TX-149-004)	4-7	A2	1.6	1.6	4.1	31.1	26.9	65.3	11.0	10.9	—	—	—	—
	7-14	2Bt	—	—	—	—	—	—	—	66.9	—	—	—	—
	14-23	2Btss	—	—	—	—	—	—	—	71.2	—	—	—	—
	23-37	2BCtss	0.1	0.2	0.2	0.5	2.4	3.4	14.8	75.7	—	—	—	—
	37-51	2C1	0.1	0.1	0.3	0.5	1.2	2.2	21.3	75.9	—	—	—	—
	51-62	2C2	0.1	0.1	0.2	0.4	0.5	1.3	16.4	75.0	—	—	—	—
	62-80	2C3	0.1	0.2	0.4	0.8	1.0	2.5	15.6	79.0	—	—	—	—

1 Analysis by the Soil Characterization Laboratory, Texas A&M University, College Station, Texas.

2 Analysis by the Department of Plant and Soil Science, Texas Tech University, Lubbock, Texas.

3 Location of pedon is the same as that of the typical pedon for the series described in the section "Soil Series and Their Morphology".

4 Location of Arol pedon: In La Grange; from the intersection of U.S. Highway 77 and Texas Highway 71, 2.6 miles north on U.S. Highway 77, 10.1 miles northeast on Farm Road 2145, 0.4 mile on Farm Road 1291, and 125 feet northwest in pasture.

5 Location of Cadell pedon: In Flatonia; from the intersection of Interstate Highway 10 and Texas Highway 95, 5.45 miles northwest on Texas Highway 95, 0.7 mile south on county road, and 650 feet west in rangeland.

6 Location of Normangee soil: In Cistern; from the intersection of Texas Highway 95 and Farm Road 2237, 4.0 miles north on Texas Highway 95, 0.25 mile west on homestead and pasture road, 500 feet north on road over pipeline, and 20 feet southwest of road in mesquite rangeland.

7 Location of Rutersville pedon: In LaGrange; from the intersection of U.S. Highway 77 and Texas Highway 71, 2.6 miles north on U.S. Highway 77, 10.1 miles northeast on Farm Road 2145, 3.7 miles northeast on Farm Road 1291, 0.4 mile northwest on County Road 134, and 125 feet northeast in wooded area.

8 Location of Singleton pedon: In LaGrange; from the intersection of U.S. Highway 77 and Texas Highway 71, 2.6 miles north on U.S. Highway 77, 5.8 miles northeast on Farm Road 2145, 1.1 miles northwest on County Road 149, and 125 feet south in pasture.

9 Location of Singleton pedon: In Muldoon; from the intersection of Farm Road 2237 and Farm Road 154, 3.75 miles south on Farm Road 154, 1.5 miles east on county road, and 50 feet north in pasture.

Table 18.--Chemical Analyses of Selected Soils

(Dashes indicate the determination was not made. TR means trace.)

Soil name and sample number	Depth	Horizon	Extractable bases: Ca	Extractable bases: Mg	Extractable bases: Na	Extractable bases: K	Extractable bases: Sum	Extractable acidity	Cation exchange capacity	Base Saturation	Organic carbon	pH soil:water (1:1)	Elec. Conductivity	Exchangeable sodium	SAR
	In		Meq/100g							Pct	Pct	pH	mmhos/cm	Pct	
Arol:[2,4]	0-4	A1	6.6	1.2	0.1	0.9	8.8	—	8.5	100	0.9	6.0	0.4	1.2	0.6
(S80TX-149-001)	4-7	A2	6.8	0.8	0.1	0.3	8.0	—	5.4	100	0.6	5.6	0.4	1.9	0.1
	7-14	Bt1	11.9	4.1	0.8	0.5	17.3	—	33.7	51	0.8	4.5	0.3	2.4	1.7
	14-30	Bt2	24.1	4.6	1.0	0.6	30.3	—	25.6	100	0.7	4.7	0.7	4.1	0.2
	30-34	Bt3	24.3	4.1	1.3	0.7	30.4	—	31.3	100	0.4	7.0	1.4	4.2	0.2
	34-41	Cr1	61.3	0.5	1.8	1.4	65.0	—	38.3	100	0.1	7.1	2.0	4.7	0.2
	41-66	Cr2	27.4	4.0	1.3	1.2	33.9	—	35.4	96	0.1	7.0	1.3	3.7	0.3
	88-96	Cr3	24.8	3.9	1.7	1.5	31.9	—	33.1	96	0.1	6.9	0.7	5.1	0.3
Cadell:[1,5]	0-5	Ap	8.7	1.7	0.2	0.2	10.8	—	10.3	100	0.76	6.6	0.5	1.0	1.0
(S85TX-149-003)	5-14	Bt1	20.0	6.1	1.8	0.3	28.2	—	30.4	93	0.54	6.7	0.5	6.0	2.0
	14-18	Bt2	26.9	6.3	3.5	0.3	37.0	—	23.5	100	0.39	7.4	1.6	16.0	9.0
	18-27	Btk1	87.6	7.6	4.5	0.4	100.2	—	24.6	100	0.23	7.7	2.9	13.0	11.0
	27-42	Btk2	89.6	8.5	4.9	0.5	103.5	—	26.0	100	0.18	7.5	4.8	11.0	8.0
	42-54	2Cy	152.0	9.5	6.9	0.7	169.1	—	34.6	100	0.21	7.2	7.2	10.0	8.0
	54-80	2C	32.9	12.8	9.8	1.1	56.6	—	46.6	100	0.07	7.2	4.7	14.0	11.0
Carmine:[1,3]	0-7	A	2.1	0.4	0.1	0.1	2.7	—	3.7	73	0.46	5.4	—	3.0	—
(S90TX-149-002)	7-14	AE	1.6	0.4	0.0	0.1	2.1	—	3.1	68	0.20	6.0	—	0.0	—
	14-36	E	1.1	0.2	0.0	0.0	1.3	—	2.2	59	0.11	6.2	—	0.0	—
	36-47	2Bt1	7.0	4.0	0.2	0.2	11.4	—	13.8	82	0.15	4.5	—	1.0	—
	47-60	2Bt2	5.9	2.9	0.3	0.1	9.2	—	—	—	0.12	4.4	—	—	—
	60-65	3Bt3	11.3	4.9	0.5	0.3	17.1	—	19.8	86	0.10	4.2	—	3.0	—
	65-80	3BCt	10.5	4.7	0.6	0.2	16.0	—	17.2	93	0.11	4.4	—	4.0	—
Flatonia:[2,3]	0-4	Ap	20.9	1.2	0.1	1.6	23.8	—	24.7	96	2.1	6.3	0.7	0.4	0.2
(S80TX-149-005)	4-14	Bt1	37.9	2.6	0.2	1.7	47.4	—	41.9	100	1.2	6.3	0.5	0.5	0.6
	14-33	Bt2	74.3	2.2	0.5	1.6	78.6	—	47.2	100	0.8	7.3	0.5	1.1	0.4
	33-43	Bt3	478.3	2.6	0.4	1.3	482.6	—	35.8	100	0.6	7.4	0.4	1.1	0.7
	43-55	BCk	512.1	0.5	0.3	1.9	514.8	—	38.0	100	0.2	7.5	0.4	0.8	0.6
	55.80	Cr	678.9	—	1.6	—	680.5	—	19.8	—	0.1	7.5	0.3	—	0.5
Normangee:[1,6]	0-5	Ap	14.1	4.0	0.2	0.7	19.0	—	21.6	88	2.09	5.1	0.6	1.0	1.0
(S87TX-149-002)	5-13	Bt1	23.0	7.6	0.7	0.6	32.0	—	33.0	97	1.11	6.4	0.3	2.0	2.0
	13-27	Bt2	23.4	7.5	2.2	0.5	33.6	—	31.7	100	0.73	7.6	0.5	6.0	5.0
	27-41	Bt3	51.9	7.9	4.0	0.5	64.3	—	31.6	100	0.45	7.8	2.0	9.0	9.0
	41-48	BCt	64.0	8.7	4.8	0.6	78.1	—	34.3	100	0.26	7.2	6.5	7.0	6.0
	48-57	C1	103.8	9.6	5.1	0.6	119.1	—	33.5	100	0.24	6.8	7.7	6.0	6.0
	57-72	C2	32.0	11.8	5.8	0.8	50.4	—	39.8	100	0.20	6.8	6.7	7.0	7.0

See footnotes at end of table.

Table 18.--Chemical Analyses of Selected Soils--Continued

Soil name and sample number	Depth	Horizon	Extractable bases: Ca	Mg	Na	K	Sum	Extractable acidity	Cation exchange capacity	Base saturation	Organic carbon	pH soil:water (1:1)	Elec. Conductivity	Exchangeable sodium	SAR
	In		----------Meq/100g----------							Pct	Pct	pH	mmhos/cm	Pct	
Rek:[1,3]	0-3	Ap	1.0	0.9	0.1	0.4	2.4	0.6	4.3	56	0.52	4.6	—	2.0	—
(S88TX-149-001)	3-7	Bt1	2.1	3.6	0.2	0.3	6.2	6.1	15.4	40	0.53	4.3	—	1.0	—
	7-12	Bt2	2.4	5.4	0.3	0.2	8.3	15.0	25.9	32	0.63	4.3	—	1.0	—
	12-22	Bt3	1.6	4.0	0.3	0.2	6.2	12.3	20.6	30	0.38	4.2	—	2.0	—
	22-37	2Bt4	0.9	2.1	0.2	0.1	3.3	6.8	11.3	30	0.17	4.3	—	2.0	—
	37-49	2Bt5	1.2	2.1	0.3	0.1	3.8	9.8	13.3	28	0.11	4.2	—	2.0	—
	49-63	2Bt6	1.4	2.4	0.3	0.1	4.3	11.3	15.8	27	0.11	4.1	—	2.0	—
	63-80	2Cr	1.2	1.3	0.4	0.1	3.0	7.0	9.9	31	0.09	4.2	—	4.0	—
Rutersville:[2,7]	0-8	A1	2.8	0.4	0.1	0.5	3.8	—	4.6	83	0.4	5.5	0.2	2.2	0.6
(S80TX-149-003)	8-16	A2	0.4	—	0.1	0.3	0.8	—	1.4	57	0.1	6.0	0.1	7.1	0.9
	16-23	Btg1	8.0	4.6	1.7	0.8	15.1	—	19.5	77	0.3	4.0	1.1	8.7	20.7
	23-33	Btg2	6.5	3.2	1.5	0.6	11.8	—	13.8	86	0.3	4.2	1.7	10.9	20.3
	33-43	Btg3	4.4	2.4	2.5	0.6	9.9	—	13.1	76	0.1	5.1	2.1	19.1	13.2
	43-62	Cr1	8.4	2.5	3.1	0.8	14.8	—	18.1	82	0.2	6.5	3.8	17.1	18.3
	62-72	Cr2	11.1	5.4	—	1.1	17.6	—	26.3	—	0.2	6.3	4.5	—	17.9
	105-111		5.3	2.5	—	0.7	8.5	—	11.3	—	0.2	5.0	3.2	—	17.7
Schulenburg:[1,3]	0-5	A1	23.0	0.4	0.1	0.3	23.8	—	20.8	100	1.58	5.9	0.3	1.0	—
(S90TX-149-001)	5-13	A2	27.2	0.4	0.1	0.3	28.1	—	24.3	100	1.23	6.4	—	0.0	—
	13-19	Bt1	21.1	1.7	0.2	0.3	23.3	—	23.5	99	0.78	6.6	—	1.0	—
	19-29	Bt2	20.8	1.0	0.2	0.3	22.4	—	22.4	100	0.69	6.6	—	1.0	—
	29-36	Btk1	53.9	0.8	0.2	0.3	55.3	—	21.8	100	0.86	8.1	—	1.0	—
	36-42	Btk2	54.2	0 7	0.2	0.3	55.5	—	21.8	100	0.69	8.1	—	1.0	—
	42-49	Btk3	53.9	0.7	0.2	0.3	55.1	—	21.1	100	0.58	8.1	—	1.0	—
	49-57	Btk4	50.4	0.7	0.2	0.3	51.7	—	17.4	100	0.49	8.1	—	1.0	—
	57-80	BCk	46.1	0.8	0.2	0.2	47.3	—	14.3	100	0.28	8.2	—	1.0	—
Singleton:[2,8]	0-6	Ap	3.6	0.4	0.1	0.6	4.7	—	1.8	100	0.4	5.7	0.4	5.6	0.5
(S80TX-149-002)	6-9	A	3.6	1.2	0.1	0.4	4.9	—	1.6	100	0.3	6.5	0.3	6.3	1.0
	9-16	Bt1	13.9	3.4	2.5	0.8	20.6	—	30.0	69	0.8	4.5	0.4	8.3	38.0
	16-24	Bt2	13.1	3.3	2.2	0.7	19.3	—	28.0	69	0.6	5.3	2.3	7.9	12.5
	24-34	Bt3	11.4	3.4	2.3	0.5	17.6	—	22.2	79	0.3	6.7	2.4	10.4	9.3
	34-44	Cr1	23.8	3.3	2.8	0.6	30.5	—	19.3	100	0.1	7.7	1.3	14.5	10.3
	44-57	Cr2	16.2	3.3	3.4	0.8	23.7	—	29.9	100	0.1	7.2	1.9	11.4	16.3
	57-64	Cr3	11.6	2.4	2.1	0.6	16.7	—	16.6	100	0.1	7.2	1.2	12.7	34.3
Singleton:[1,9]	0-6	Ap	1.7	0.4	0.1	0.2	2.4	0.2	3.7	65	0.68	4.8	0.2	2.0	1.0
(S87TX-149-005)	6-15	Bt1	22.0	6.0	1.5	0.3	29.7	0.6	34.9	85	0.71	4.8	0.3	4.0	3.0
	15-25	Bt2	21.6	5.3	1.7	0.4	28.9	—	27.2	100	0.44	6.8	0.7	5.0	3.0
	25-31	BC	106.6	6.7	3.2	0.5	117.1	—	32.9	100	0.29	7.9	1.4	8.0	5.0
	31-47	Cr	115.1	6.2	4.1	0.6	125.9	—	32.6	100	0.40	7.6	2.7	9.0	5.0

See footnotes at end of table.

Table 18.--Chemical Analyses of Selected Soils--Continued

Soil name and sample number	Depth	Horizon	Extractable bases: Ca	Mg	Na	K	Sum	Extractable acidity	Cation exchange capacity	Base Saturation	Organic carbon	pH soil:water (1:1)	Elec. Conductivity	Exchangeable sodium	SAR
	In		Meq/100g							Pct	Pct	pH	mmhos/cm	Pct	
Winedale:[1,3]	0-4	A1	5.9	2.2	0.2	0.1	8.4	—	—	—	2.32	4.7	—	—	—
(S90TX-149-004)	4-7	A2	3.0	1.5	0.2	0.1	4.8	—	9.0	54	0.72	4.5	—	2.0	—
	7-14	2Bt	17.2	10.4	2.6	0.6	30.8	—	52.6	59	0.86	3.8	0.5	5.0	—
	14-23	2Btss	18.1	12.8	3.5	0.8	32.8	—	44.8	73	0.63	3.6	1.2	8.0	—
	23-37	2BCtss	22.1	12.8	5.4	1.1	41.3	—	47.4	87	0.51	3.6	3.0	11.0	—
	37-51	2C1	91.5	13.8	5.6	1.1	112.0	—	45.0	100	0.37	3.5	6.4	12.0	—
	51-62	2C2	35.9	14.4	6.5	1.2	58.0	—	47.4	100	0.31	3.6	6.0	14.0	—
	62-80	2C3	29.6	14.5	6.7	1.2	51.9	—	—	—	0.35	4.8	5.9	—	—

1 Analysis by the Soil Characterization Laboratory, Texas A&M University, College Station, Texas.

2 Analysis by the Department of Plant and Soil Science, Texas Tech University, Lubbock, Texas.

3 Location of pedon sample is the same as that of the pedon given as typical of the series described in "Soil Series and Their Morphology."

4 Location of Arol pedon: In La Grange; from the intersection of U.S. Highway 77 and Texas Highway 71, 2.6 miles north on U.S. Highway 77, 10.1 miles northeast on Farm Road 2145, 0.4 mile on Farm Road 1291, and 125 feet northwest in pasture.

5 Location of Cadell pedon: In Flatonia; from the intersection of Interstate Highway 10 and Texas Highway 95, 5.45 miles northwest on Texas Highway 95, 0.7 mile south on county road, and 650 feet west in rangeland.

6 Location of Normangee pedon: In Cistern; from the intersection of Texas Highway 95 and Farm Road 2237, 4.0 miles north on Texas Highway 95, 0.25 mile west on homestead and pasture road, 500 feet north on road over pipeline, and 20 feet southwest of road in mesquite rangeland.

7 Location of Rutersville pedon: In La Grange; from the intersection of U.S. Highway 77 and Texas Highway 71, 2.6 miles north, 10.1 miles northeast on Farm Road 2145, 3.7 miles northeast on Farm Road 1291, 0.4 mile northwest on County Road 134, and 125 feet northeast in wooded area.

8 Location of Singleton pedon: In La Grange; from the intersection of U.S. Highway 77 and Texas Highway 71, 2.6 miles north on U.S. Highway 77, 5.8 miles northeast on Farm Road 2145, 1.1. miles northwest on County Road 149, and 125 feet south in pasture.

9 Location of Singleton pedon: In Muldoon; from the intersection of Farm Road 2237 and Farm Road 154, 3.75 miles south on Farm Road 154, 1.5 miles east on county road, and 50 feet north in pasture.

Table 19.--Clay Mineralogy of Selected Soils

(Analysis by the Soil Characterization Laboratory, Texas A&M University, College Station, Texas. Dashes indicate data were not available. A = more than 50 percent, B = 10 to 50 percent, 1 = trace, 2 = small, 3 = moderate, and 4 = abundant.)

Soil Series and sample number	Depth	Horizon	Clay minerals (x-ray diffraction)			
			Smectite	14Å intergrade	Kaolinite	Quartz
	In					
Cadell:[2]						
(S85TX-149-003)	0-5	Ap	--	--	--	--
	5-14	Bt1	A	--	4	4
	14-18	Bt2	A	--	4	4
	18-27	Btk1	--	--	--	--
	27-42	Btk2	--	--	--	--
	42-54	2Cy	--	--	--	--
	54-80	2C	A	--	4	4
Normangee:[3]						
(S87TX-149-002)	0-5	Ap	--	--	--	--
	5-13	Bt1	A	--	B	4
	13-27	Bt2	A	--	B	4
	27-41	Bt3	--	--	--	--
	41-48	BCt	--	--	--	--
	48-57	C1	--	--	--	--
	57-72	C2	--	--	--	--
Rek:[1]						
(S88TX-149-001)	0-3	Ap	--	--	--	--
	3-7	Bt1	4	B	B	4
	7-12	Bt2	4	B	B	4
	12-22	Bt3	--	--	--	--
	22-37	2Bt4	--	--	--	--
	37-49	2Bt5	--	--	--	--
	49-63	2Bt6	B	--	B	4
	63-80	2Cr	A	--	B	4
Singleton:[4]						
(S87TX-149-005)	0-6	Ap	--	--	--	--
	6-15	Bt1	A	--	4	4
	15-25	Bt2	A	--	4	4
	25-31	BC	--	--	--	--
	31-47	Cr	A	--	4	4

1 Location of pedon sample is the same as that of the typical pedon for the series described in the section “Soil Series and Their Morphology.”

2 Location of Cadell pedon: In Flatonia, from the intersection of Interstate Highway 10 and Texas Highway 95, 5.45 miles northwest on Texas Highway, 0.7 mile south on county road, and 650 feet west in rangeland.

3 Location of Normangee pedon: In Cistern, from the intersection of Texas Highway 95 and Farm Road 2237, 4.0 miles north on Texas Highway 95, 0.25 mile west on homestead and pasture road, 500 feet north on road over pipeline, and 20 feet southwest of road in mesquite rangeland.

4 Location of Singleton pedon: In Muldoon, from the intersection of Farm Road 2237 and Farm Road 154, 3.75 miles south on Farm Road 154, 1.5 miles east on county road, and 50 feet north in pasture.

Table 20.--Engineering Index Test Data

(Analysis by the Soil Mechanics Laboratory, Natural Resources Conservation Service, Fort Worth, Texas. Dashes indicate data were not available. NP means nonplastic)

Soil name, sample number, horizon, and depth in inches	Classification: AASHTO	Classification: Unified	Grain-size distribution: Percentage passing sieve-- 3/4 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	Percentage smaller than 0.05 mm	0.005 mm	0.002 mm	Liquid limit	Plasticity index
												Pct	
Cadell:[3]													
(THD87TX-149-003)													
Ap---- 0-5	A-4	SC-SM	--	--	--	--	99	40	24	13	8	20	4
Bt1---- 5-14	A-7-6	CH	--	--	--	--	--	64	53	19	43	56	36
Bt2---- 14-18	A-6	CL	--	--	--	--	--	55	44	34	29	36	22
Btk2---- 27-42	A-7-6	CL	--	--	--	--	--	65	53	43	33	43	29
BCk---- 42-54	A-7-6	CH	--	--	--	--	--	78	73	66	48	71	49
C---- 54-80	A-7-6	CH	--	--	--	--	--	91	87	79	48	99	73
Carbengle:[1,2]													
(THD88TX-149-002)													
A---- 0-10	A-6	SC	--	100	98	95	86	41	37	35	28	40	23
Bk1---- 10-21	A-7-6	CL-CH	--	--	--	100	--	81	79	59	38	50	28
Bk2---- 21-33	A-7-6	CH	--	--	--	--	--	87	85	66	45	60	35
Gredge:[1]													
(THD86TX-149-002)													
A---- 0-6	A-2-4	SM	--	--	--	100	99	25	18	10	6	--	NP
Bt1---- 6-16	A-7-6	CH	--	--	--	100	--	58	53	53	48	54	35
Bt2---- 16-24	A-7-6	CL	--	--	--	100	--	56	52	52	44	49	32
Bt3---- 24-34	A-7-6	SC	--	--	--	--	99	42	38	36	29	43	26
BCt---- 34-51	A-2-4	SC	--	--	--	--	100	30	26	26	21	36	15
BC---- 51-72	A-2-4	SM	--	--	--	100	99	26	23	19	16	32	7
Kurten:[1]													
(THD86TX-149-003)													
A---- 0-7	A-4	ML	--	--	--	100	--	51	29	10	3	--	NP
Bt1---- 7-19	A-7-6	CH	--	--	--	100	--	71	65	58	48	57	36
Bt2---- 19-32	A-7-6	CL	--	--	--	100	--	70	58	46	40	48	31
Bt3---- 32-48	A-7-6	CL	--	--	--	100	--	71	60	45	37	46	31
C---- 48-60	A-7-6	CL	--	--	--	100	--	72	59	42	34	42	28
Normangee:[4]													
(THD87TX-149-002)													
Ap---- 0-5	A-6	CL	--	--	--	100	--	73	61	33	26	35	16
Bt1---- 5-13	A-7-6	CH	--	--	--	100	--	80	75	58	48	56	34
Bt3---- 27-41	A-7-6	CH	--	--	--	100	--	84	78	58	47	62	43
C2---- 57-72	A-7-6	CH	--	--	--	100	--	94	91	71	48	81	58
Rutersville:[1]													
(THD85TX-149-004)													
Ap---- 0-7	A-2-4	SM	--	--	--	--	98	30	21	7	4	--	NP
E---- 7-14	A-2-4	SM	--	--	--	--	98	26	19	7	5	--	NP
Bt1---- 14-24	A-7-6	CL	--	--	--	--	--	56	50	41	38	45	27
Bt2---- 24-34	A-6	SC	--	--	--	--	98	44	34	25	23	33	18
BC---- 46-54	A-2-4	SC-SM	--	--	--	--	95	28	21	18	17	23	10
Cr2---- 65-79	A-7-6	CL	--	--	--	--	--	62	53	40	35	43	23
Shalba:[5]													
(THD88TX-149-001)													
Bt1---- 4-10	A-2-6	CL	--	--	--	100	--	65	60	47	41	48	32
Bt2---- 10-18	A-7-6	CH	--	--	--	100	--	78	72	55	47	67	46

See footnotes at end of table.

Table 20.--Engineering Index Test Data--Continued

Soil name, sample number, horizon, and depth in inches	Classification		Grain-size distribution									Liquid limit	Plasticity index
			Percentage passing sieve—						Percentage smaller than				
	AASHTO	Unified	3/4 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	0.05 mm	0.005 mm	0.002 mm	Pct	
Singleton:[6]													
(THD87TX-149-005)													
Ap——— 0-6	A-4	SM	—	—	—	—	98	44	31	8	3	—	NP
Bt1——— 6-15	A-7-6	CL	—	—	—	100	—	64	60	46	41	43	27
Bt2——— 15-25	A-7-6	CL	—	—	—	100	—	66	60	44	37	44	31
BC——— 25-31	A-7-6	CH	—	—	—	100	—	75	71	51	41	52	34
Zack:[7]													
(THD85TX-149-001)													
A——— 0-6	A-4	SM	—	—	—	—	99	46	31	19	15	—	NP
Bt——— 6-17	A-7-6	CL	—	—	—	—	—	66	58	39	35	46	27
Zulch:[1]													
(THD86TX-149-001)													
A——— 0-5	A-4	CL-ML	—	—	—	100	—	54	45	18	13	22	5
Bt1——— 5-28	A-7-6	CL-CH	—	—	—	100	—	70	65	43	35	50	32
Bt2——— 28-39	A-7-6	CL	—	—	—	100	—	71	66	43	35	47	31
CB——— 39-48	A-7-6	CH	—	—	—	100	—	66	58	39	35	60	42

1 Location of pedon sample is the same as that of the typical pedon described for the series in the section "Soil Series and Their Morphology"

2 The engineering data is outside of the range of the series, because the CaCo3 clays were added to the mineral clay percent. The total clay percent indicated more than 35 percent. This total clay percent is outside of series range.

3 Location of Cadell pedon: In Flatonia, from the intersection of Interstate Highway 10 and Texas Highway 95, 5.45 miles northwest on Texas Highway 95, 0.7 mile south on county road, and 650 feet west in rangeland.

4 Location of Normangee pedon: In Cistern, from the intersection of Texas Highway 95 and Farm Road 2237, 4.0 miles north on Texas Highway 95, 0.25 mile west on homestead and pasture road, 500 feet north on road over pipeline, and 20 feet southwest of road in mesquite rangeland.

5 Location of Shalba pedon: In Muldoon, 3.7 miles south on Farm Road 154, 1.6 miles east on county road, 0.4 mile north in wooded pasture.

6 Location of Singleton pedon: In Muldoon, from the intersection of Farm Road 2237 and Farm Road 154, 3.75 miles south on Farm Road 154, 1.5 miles east on county road, and 50 feet north in pasture.

7 Location of Zack pedon: In Cistern, from the intersection of Texas Highway 95 and Farm Road 2237, 0.1 mile north on Texas Highway 95, 0.5 mile west on county road, 0.3 mile south on county road, and 200 feet west in pasture.

Table 21.--Classification of the Soils

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series.)

Soil name	Family or higher taxonomic class
Arol	Fine, smectitic, thermic Udic Paleustalfs
Bergstrom	Fine-silty, mixed, superactive, thermic Cumulic Haplustolls
Bleiblerville	Fine, smectitic, thermic Udic Haplusterts
Bosque	Fine-loamy, mixed, superactive, thermic Cumulic Haplustolls
Branyon	Fine, smectitic, thermic Udic Haplusterts
Brenham	Fine-silty, carbonatic, thermic Udic Calciustolls
Burleson	Fine, smectitic, thermic Udic Haplusterts
Burlewash	Fine, smectitic, thermic Ultic Paleustalfs
Cadell	Fine, smectitic, thermic Aquertic Paleustalfs
Carbengle	Fine-loamy, carbonatic, thermic Udic Calciustolls
Carmine	Loamy-skeletal, mixed, active, thermic Udic Paleustalfs
Chazos	Fine, smectitic, thermic Udic Paleustalfs
Coarsewood	Coarse-silty, mixed, superactive, calcareous, thermic Udic Ustifluvents
Crockett	Fine, smectitic, thermic Udertic Paleustalfs
Degola	Fine-loamy, mixed, superactive, hyperthermic Cumulic Haplustolls
Denhawken*	Fine, smectitic, hyperthermic Vertic Haplustepts
Dubina	Fine, smectitic, thermic Udic Paleustolls
Dutek	Loamy, siliceous, active, thermic Arenic Haplustalfs
Edge	Fine, mixed, active, thermic Udic Paleustalfs
Elmendorf*	Fine, smectitic, hyperthermic Vertic Argiustolls
Flatonia	Fine, smectitic, thermic Udertic Argiustolls
Frelsburg	Fine, smectitic, thermic Udic Calciusterts
Gad	Sandy, mixed, thermic Udic Ustifluvents
Ganado	Fine, smectitic, hyperthermic Typic Hapluderts
Gholson	Fine-loamy, siliceous, active, thermic Udic Haplustalfs
Gredge	Fine, smectitic, thermic Udic Paleustalfs
Greenvine	Fine, smectitic, thermic Leptic Udic Haplusterts
Hallettsville	Fine, smectitic, thermic Udertic Paleustolls
Inez*	Fine, smectitic, hyperthermic Aquertic Chromic Hapludalfs
Joiner	Siliceous, thermic Psammentic Paleustalfs
Knolle	Fine-loamy, siliceous, superactive, thermic Ultic Haplustalfs
Koether	Sandy-skeletal, siliceous, thermic Lithic Ustorthents
Krum	Fine, smectitic, thermic Udertic Haplustolls
Kurten	Fine, smectitic, thermic Udertic Paleustalfs
Latium	Fine, smectitic, thermic Udic Calciusterts
Lufkin	Fine, smectitic, thermic Oxyaquic Vertic Paleustalfs
Luling	Fine, smectitic, thermic Udic Haplusterts
Navidad	Coarse-loamy, siliceous, superactive, hyperthermic Cumulic Haplustolls
Normangee	Fine, smectitic, thermic Udertic Haplustalfs
Padina	Loamy, siliceous, active, thermic Grossarenic Paleustalfs
Pursley	Fine-loamy, mixed, superactive, thermic Fluventic Haplustolls
Rabbs	Fine-loamy, mixed, superactive, thermic Calcic Udic Haplustepts
Rehburg	Loamy, mixed, active, thermic Aquic Arenic Paleustalfs
Rek	Fine, mixed, semiactive, thermic Typic Haplustults
Renish	Loamy, mixed, superactive, thermic Lithic Haplustolls
Robco	Loamy, siliceous, active, thermic Aquic Arenic Paleustalfs

Table 21.--Classification of the Soils--Continued

Soil name	Family or higher taxonomic class
Roetex	Very-fine, mixed, active, thermic Aquic Hapluderts
Rutersville	Fine-loamy, mixed, active, thermic Aquic Paleustalfs
Schulenburg	Fine-loamy, mixed, superactive, thermic Udic Argiustolls
Shalba	Clayey, smectitic, thermic, shallow Udic Haplustalfs
Ships	Very-fine, mixed, active, thermic Chromic Hapluderts
Shiro	Fine, mixed, active, thermic Udic Paleustalfs
Singleton	Fine, smectitic, thermic Udic Paleustalfs
Smithville	Fine-loamy, mixed, superactive, thermic Pachic Argiustolls
Straber	Fine, mixed, thermic Aquic Paleustalfs
Tremona	Clayey, mixed, active, thermic Aquic Arenic Paleustalfs
Trinity	Very-fine, smectitic, thermic Typic Hapluderts
Uhland	Coarse-loamy, siliceous, superactive, thermic Aquic Haplustepts
Ustorthents, sandy	Sandy Ustorthents
Warda	Fine-loamy, siliceous, superactive, thermic Pachic Argiustolls
Weswood	Fine-silty, mixed, superactive, thermic Udifluventic Haplustepts
Wilson	Fine, smectitic, thermic Oxyaquic Vertic Haplustalfs
Winedale	Very-fine, smectitic, thermic Udertic Paleustalfs
Zack	Fine, smectitic, thermic Udertic Paleustalfs
Zulch	Fine, smectitic, thermic Udertic Paleustalfs

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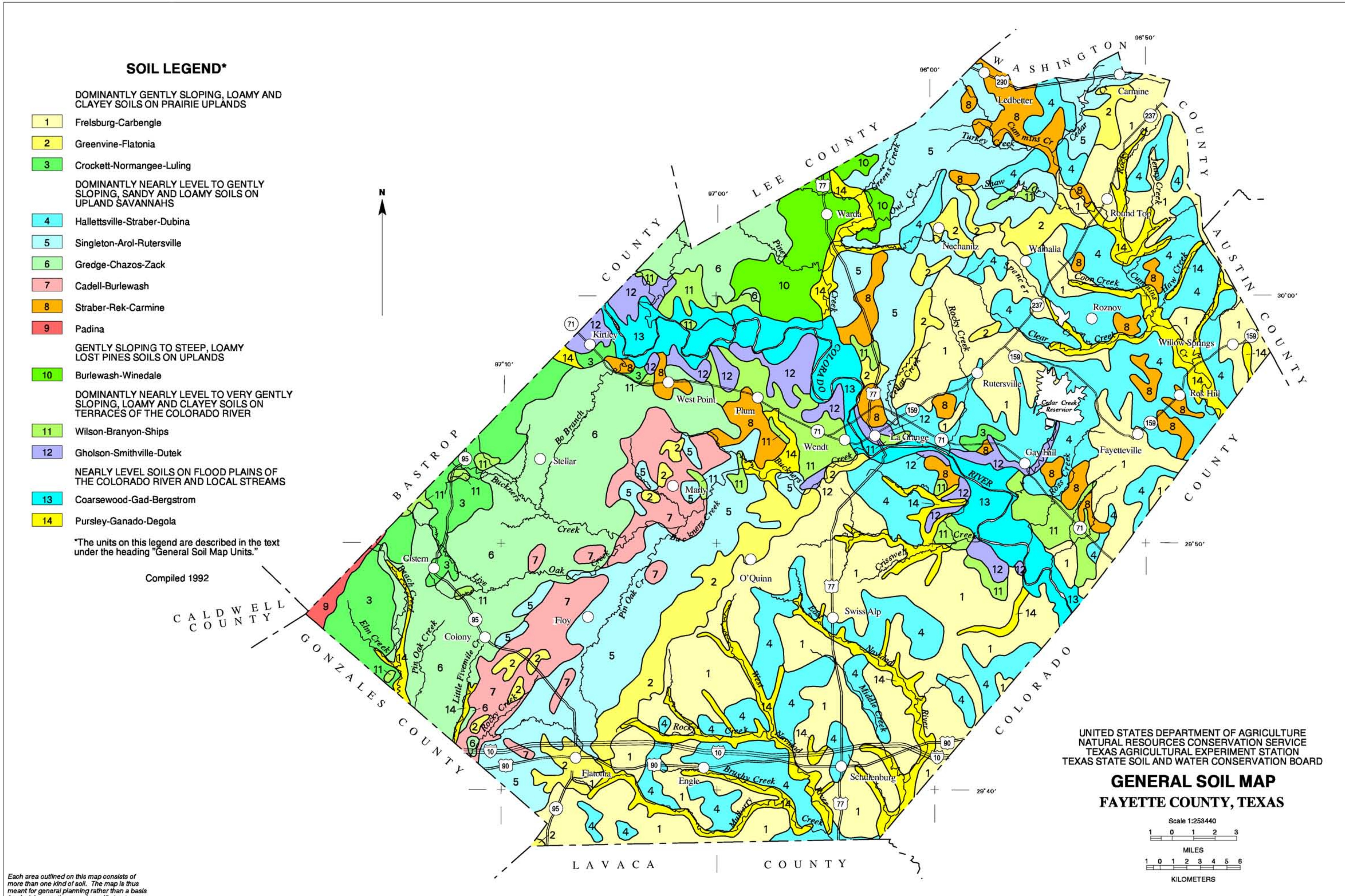
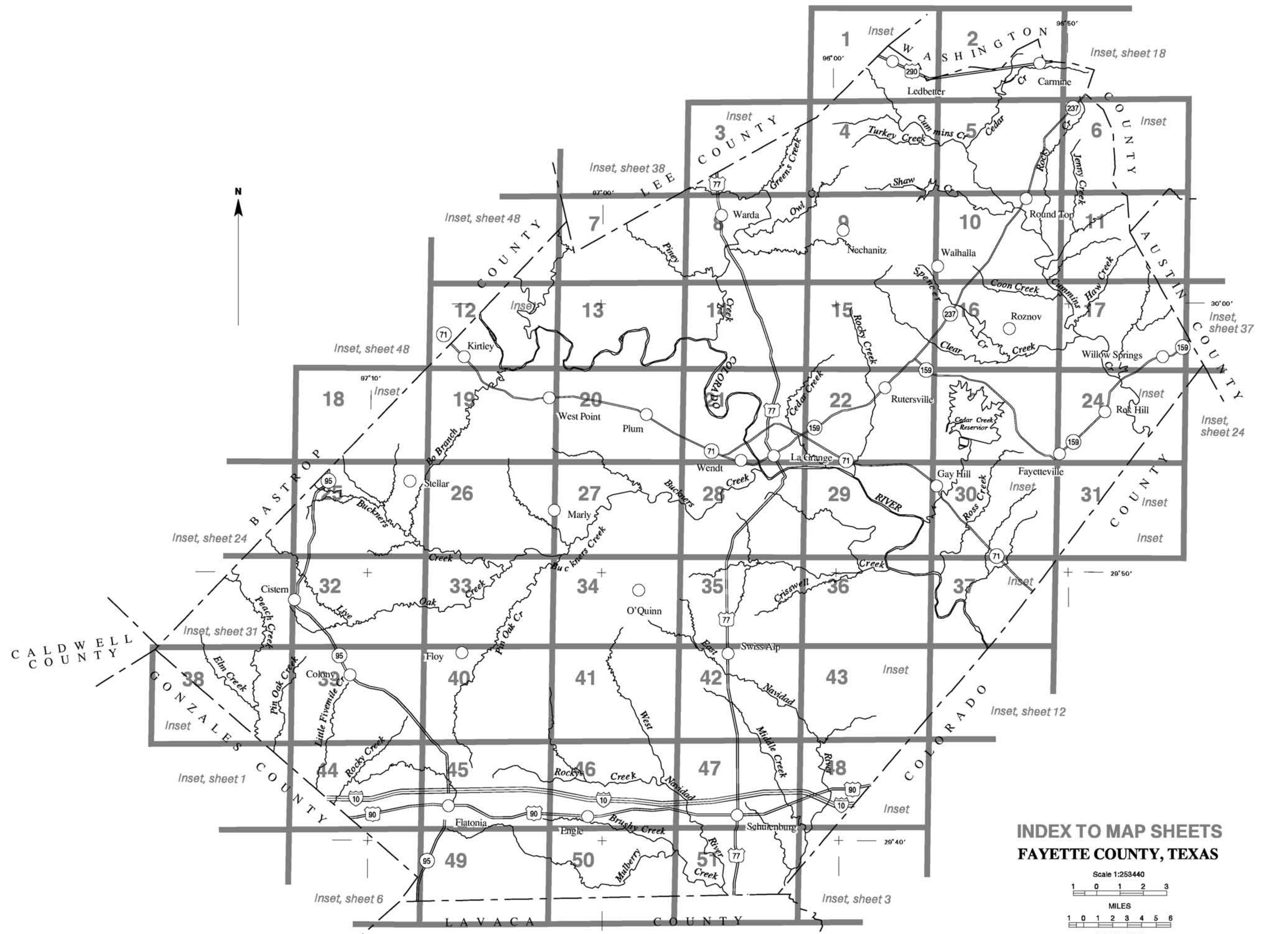

SOIL LEGEND*
DOMINANTLY GENTLY SLOPING, LOAMY AND CLAYEY SOILS ON PRAIRIE UPLANDS
1 Frelsburg-Carbengle
2 Greenvine-Flatonia
3 Crockett-Normangee-Luling
DOMINANTLY NEARLY LEVEL TO GENTLY SLOPING, SANDY AND LOAMY SOILS ON UPLAND SAVANNAHS
4 Hallettsville-Straber-Dubina
5 Singleton-Arol-Rutersville
6 Gredge-Chazos-Zack
7 Cadell-Burlewash
8 Straber-Rek-Carmine
9 Padina
GENTLY SLOPING TO STEEP, LOAMY LOST PINES SOILS ON UPLANDS
10 Burlewash-Winedale
DOMINANTLY NEARLY LEVEL TO VERY GENTLY SLOPING, LOAMY AND CLAYEY SOILS ON TERRACES OF THE COLORADO RIVER
11 Wilson-Branyon-Ships
12 Gholson-Smithville-Dutek
NEARLY LEVEL SOILS ON FLOOD PLAINS OF THE COLORADO RIVER AND LOCAL STREAMS
13 Coarsewood-Gad-Bergstrom
14 Pursley-Ganado-Degola
*The units on this legend are described in the text under the heading "General Soil Map Units."
Compiled 1992
N
WASHINGTON COUNTY
LEE COUNTY
BASTROP COUNTY
AUSTIN COUNTY
COLORADO COUNTY
CALDWELL COUNTY
GONZALES COUNTY
LAVACA COUNTY
96°50′
96°00′
97°00′
97°10′
30°00′
29°50′
29°40′
Ledbetter
Carmine
Round Top
Warda
Nechanitz
Walhalla
Roznov
Willow Springs
Kirtley
West Point
Plum
Rutersville
Cedar Creek Reservoir
Rek Hill
La Grange
Wendt
Gay Hill
Fayetteville
Stellar
Marly
Cistern
O'Quinn
Swiss Alp
Floy
Colony
Flatonia
Engle
Schulenburg
COLORADO RIVER
Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.
UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
TEXAS AGRICULTURAL EXPERIMENT STATION
TEXAS STATE SOIL AND WATER CONSERVATION BOARD
GENERAL SOIL MAP
FAYETTE COUNTY, TEXAS
Scale 1:253440
MILES
KILOMETERS


INDEX TO MAP SHEETS
FAYETTE COUNTY, TEXAS
Scale 1:253440
MILES
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WASHINGTON COUNTY
LEE COUNTY
BASTROP COUNTY
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GONZALES COUNTY
LAVACA COUNTY
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AUSTIN COUNTY
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Flatonia
Fayetteville
Round Top
Carmine
Ledbetter
Warda
Nechanitz
Walhalla
Roznov
Willow Springs
Rutersville
Kirtley
West Point
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Swiss Alp
Engle
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Inset, sheet 38
Inset, sheet 48
Inset, sheet 37
Inset, sheet 24
Inset, sheet 31
Inset, sheet 12
Inset, sheet 1
Inset, sheet 6
Inset, sheet 3

SOIL LEGEND

Map symbols consist of letters or a combination of letters and numbers. The first letter, always a capital, is the initial letter of the map unit name. The second letter is a lowercase letter, except in broadly defined units where symbols are capital letters. The third letter is a capital letter used to indicate slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas. The fourth member of some symbols is a number representing eroded phases of map units. The number 2 indicates the soil is eroded, the number 3 indicates the soil is severely eroded, and the number 4 indicates the map unit contains a significant percentage of gullied lands.

SYMBOL	NAME
ArA	Arol fine sandy loam, 0 to 2 percent slopes
Bg	Bergstrom silt loam, rarely flooded
BkB	Bleiblerville clay, 1 to 3 percent slopes
Bo	Bosque sandy clay loam, occasionally flooded
BrA	Branyon clay, 0 to 1 percent slopes
BsD	Brenham clay loam, 3 to 8 percent slopes
BuA	Burleson clay, 0 to 1 percent slopes
BwC	Burlewash fine sandy loam, 2 to 5 percent slopes
BwE	Burlewash very gravelly fine sandy loam, 5 to 20 percent slopes
BwF	Burlewash very gravelly fine sandy loam, 20 to 45 percent slopes
CaB	Cadell very fine sandy loam, 1 to 3 percent slopes
CbC	Carbengle sandy clay loam, 3 to 5 percent slopes
CbD	Carbengle sandy clay loam, 5 to 8 percent slopes
CbE4	Carbengle-Gullied land complex, 5 to 12 percent slopes
CeC	Carmine extremely gravelly very fine sandy loam, 2 to 5 percent slopes
ChB	Chazos loamy fine sand, 1 to 3 percent slopes
Co	Coarsewood silt loam, occasionally flooded
CrB	Crockett loam, 1 to 3 percent slopes
Dg	Degola loam, occasionally flooded
DnC	Dubina loamy fine sand, 2 to 5 percent slopes
DtB	Dutek loamy fine sand, 1 to 3 percent slopes
EdD2	Edge gravelly fine sandy loam, 5 to 12 percent slopes, eroded
EfB	Elmendorf-Denhawken complex, 1 to 3 percent slopes
FaB	Flatonia loam, 1 to 3 percent slopes
FrB	Frelsburg clay, 1 to 3 percent slopes
FrC	Frelsburg clay, 3 to 5 percent slopes
FrD	Frelsburg clay, 5 to 8 percent slopes
Ga	Gad loamy fine sand, rarely flooded
Gb	Gad loamy fine sand, occasionally flooded
Gd	Gad fine sand, frequently flooded
Ge	Ganado clay, occasionally flooded
Gf	Ganado clay, frequently flooded
GhA	Gholson very fine sandy loam, 0 to 1 percent slopes
GhB	Gholson very fine sandy loam, 1 to 3 percent slopes
GrB	Gredge fine sandy loam, 1 to 3 percent slopes
GvB	Greenvine clay, 1 to 3 percent slopes
GvC	Greenvine clay, 3 to 5 percent slopes
GvD4	Greenvine-Gullied land complex, 3 to 8 percent slopes
HvB	Hallettsville fine sandy loam, 1 to 3 percent slopes
IzA	Inez fine sandy loam, 0 to 1 percent slopes
JoC	Joiner sand, 2 to 5 percent slopes
KnC	Knolle fine sand, 2 to 5 percent slopes
KoC	Koether loamy fine sand, 2 to 5 percent slopes, stony
Kr	Krum silty clay, rarely flooded
KuC	Kurten very fine sandy loam, 2 to 5 percent slopes

SYMBOL	NAME
LaD	Latium clay, 3 to 8 percent slopes
LaD3	Latium clay, 5 to 15 percent slopes, severely eroded
LgD	Latium gravelly clay, 5 to 12 percent slopes
LkA	Lufkin fine sandy loam, 0 to 2 percent slopes
LuC	Luling clay, 3 to 5 percent slopes
Na	Navidad fine sandy loam, rarely flooded
Nd	Navidad fine sandy loam, occasionally flooded
NmC	Normangee clay loam, 2 to 5 percent slopes
PaC	Padina fine sand, 2 to 5 percent slopes
PD	Pits and Dumps, saline
PS	Pits and Dumps, sandy
Pu	Pursley clay loam, frequently flooded
RbC	Rabbs clay loam, 5 to 8 percent slopes
RhB	Rehburg loamy fine sand, 1 to 3 percent slopes
RkC	Rek extremely gravelly coarse sandy loam, 2 to 5 percent slopes
RnC	Renish-Rock outcrop complex, 2 to 8 percent slopes
RnE	Renish-Rock outcrop complex, 8 to 20 percent slopes, very stony
RoB	Robco fine sand, 1 to 3 percent slopes
RrB	Robco loamy fine sand, 1 to 3 percent slopes
Rt	Roetex clay, frequently flooded
RvA	Rutersville loamy fine sand, 0 to 2 percent slopes
ScC	Schulenburg sandy clay loam, 3 to 8 percent slopes
ShC	Shalba fine sandy loam, 2 to 5 percent slopes
ShC2	Shalba fine sandy loam, 2 to 5 percent slopes, eroded
ShD4	Shalba-Gullied land complex, 3 to 8 percent slopes
Sp	Ships clay, occasionally flooded
SrB	Shiro loamy fine sand, 1 to 3 percent slopes
StB	Singleton fine sandy loam, 1 to 3 percent slopes
SvA	Smithville fine sandy loam, 0 to 1 percent slopes
SwC	Straber loamy fine sand, 2 to 5 percent slopes
SxC	Straber gravelly loamy fine sand, 2 to 5 percent slopes
SxD	Straber gravelly loamy fine sand, 5 to 8 percent slopes
TrB	Tremona loamy sand, 1 to 3 percent slopes
Tw	Trinity clay, occasionally flooded
Uf	Uhland clay loam, frequently flooded
US	Ustorthents, sandy
Wa	Warda very fine sandy loam, occasionally flooded
We	Weswood loam, occasionally flooded
WsA	Wilson clay loam, 0 to 1 percent slopes
WwC	Winedale gravelly fine sandy loam, 2 to 5 percent slopes
ZkB	Zack very fine sandy loam, 1 to 3 percent slopes
ZkC	Zack gravelly fine sandy loam, 2 to 5 percent slopes
ZuA	Zulch fine sandy loam, 0 to 2 percent slopes

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state, or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline and neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool

STATE COORDINATE TICK 1 890 000 FEET

LAND DIVISION CORNER (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate — 173
- Federal — 287
- State — 52
- County, farm or ranch — 1283

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or Small (Named where applicable) — water

PITS — w

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban area) (occupied)
- Church
- School
- Indian mound (label) — Indian Mound
- Located object (label) — Tower
- Tank (label) — Gas
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) — CANAL
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial — water
- Intermittent — Int

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — ArA StB

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE (normally not shown)

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot

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8

N

2 MILES

2 KILOMETERS

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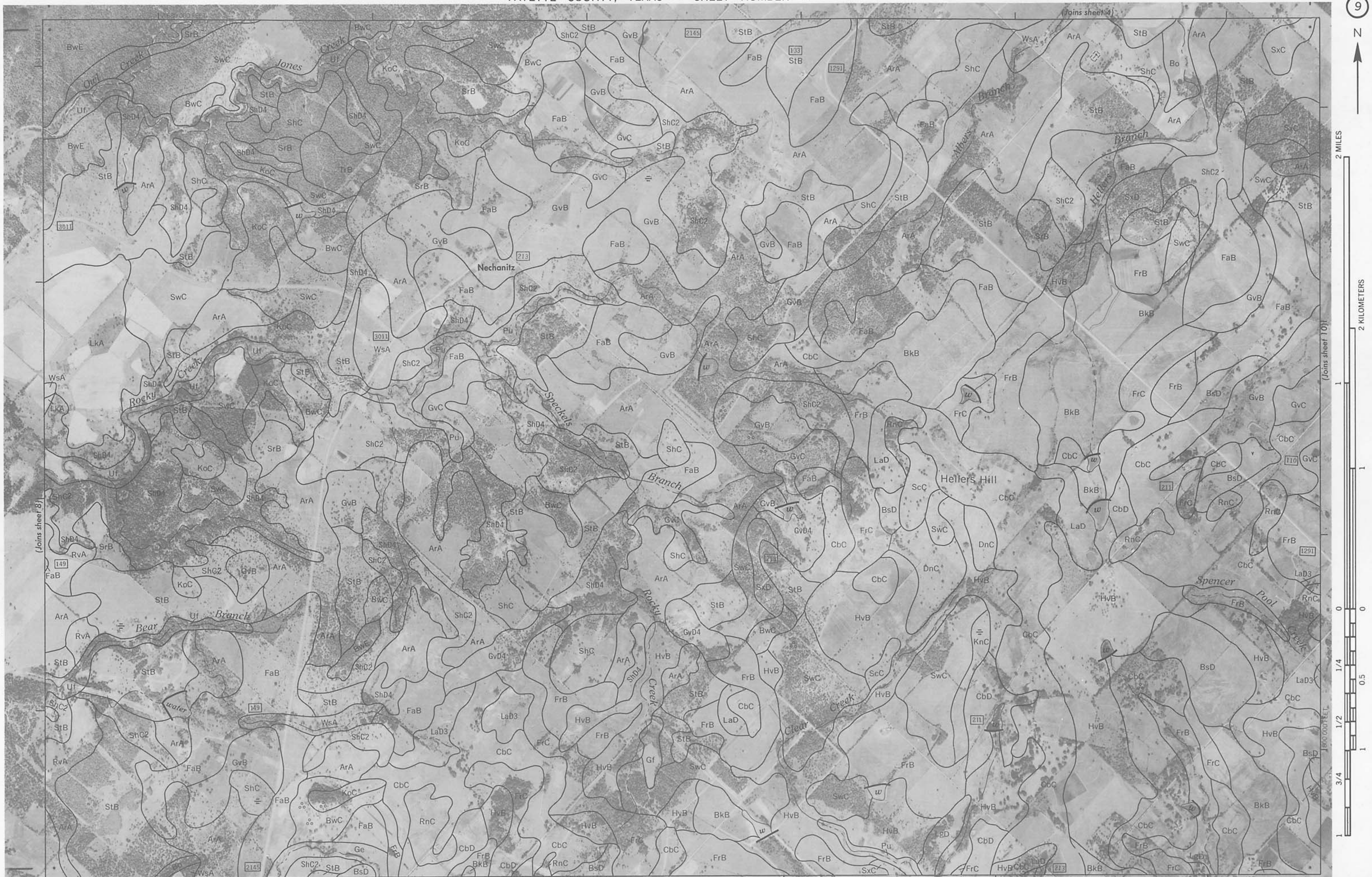

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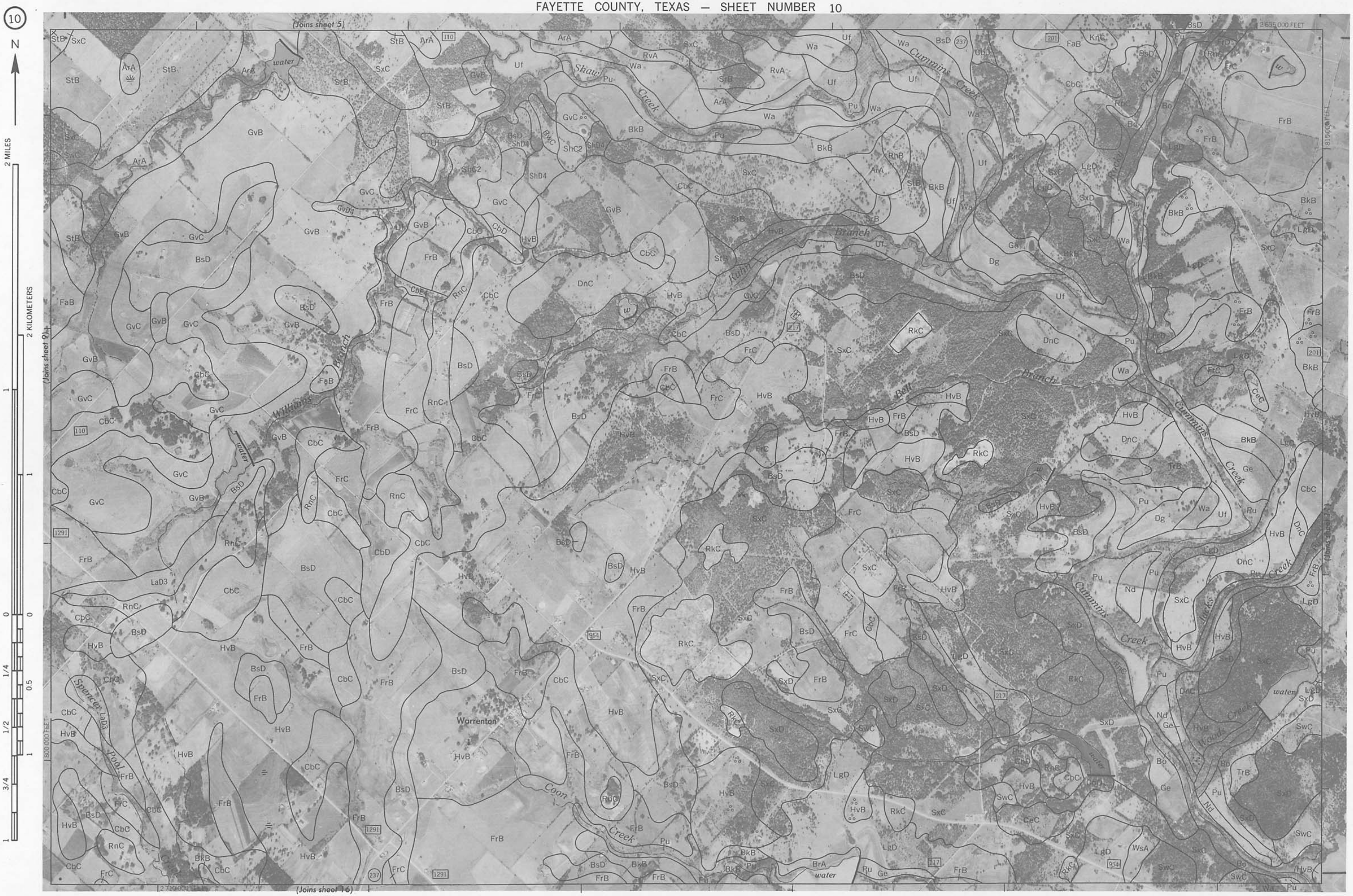

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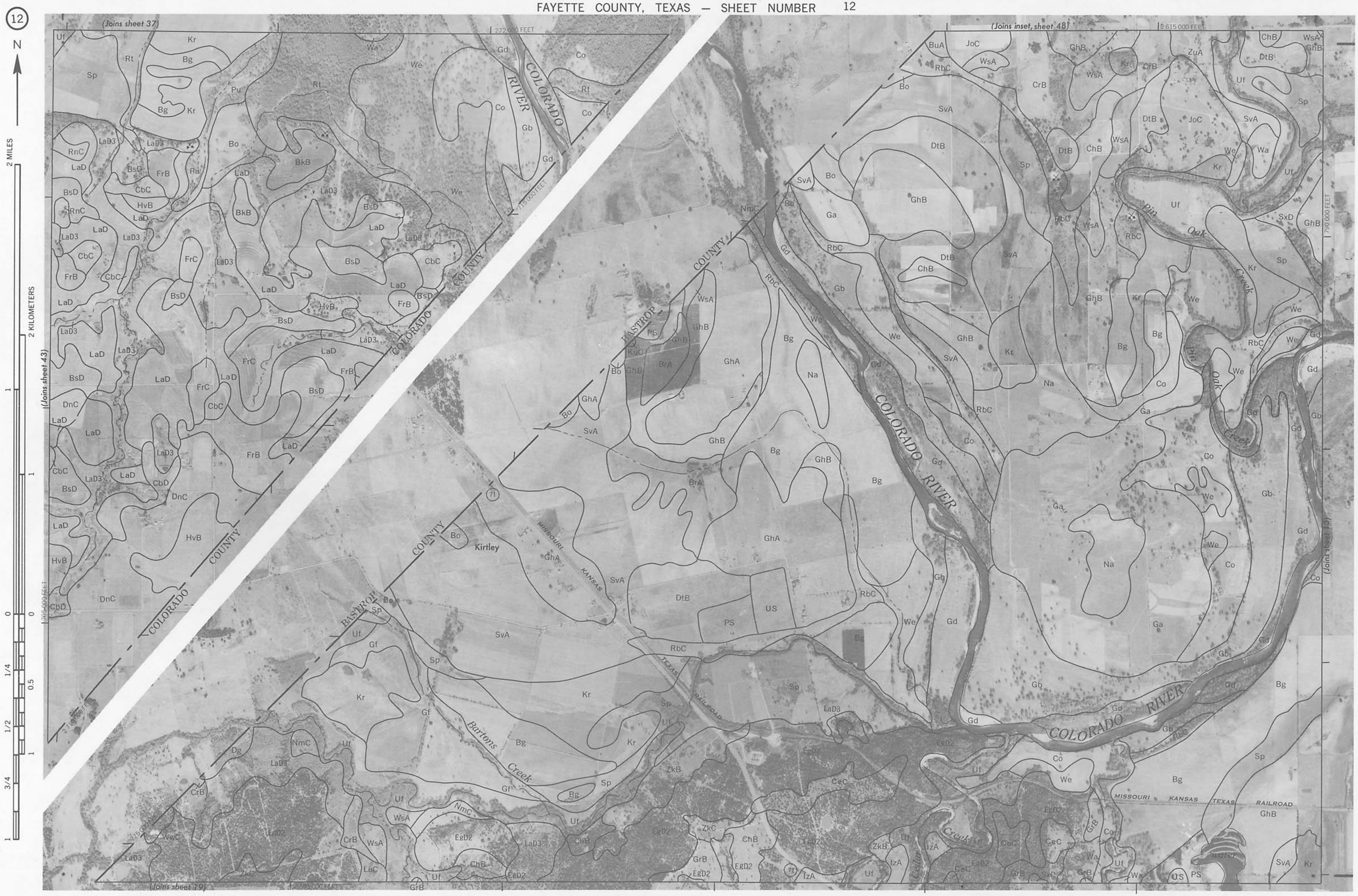

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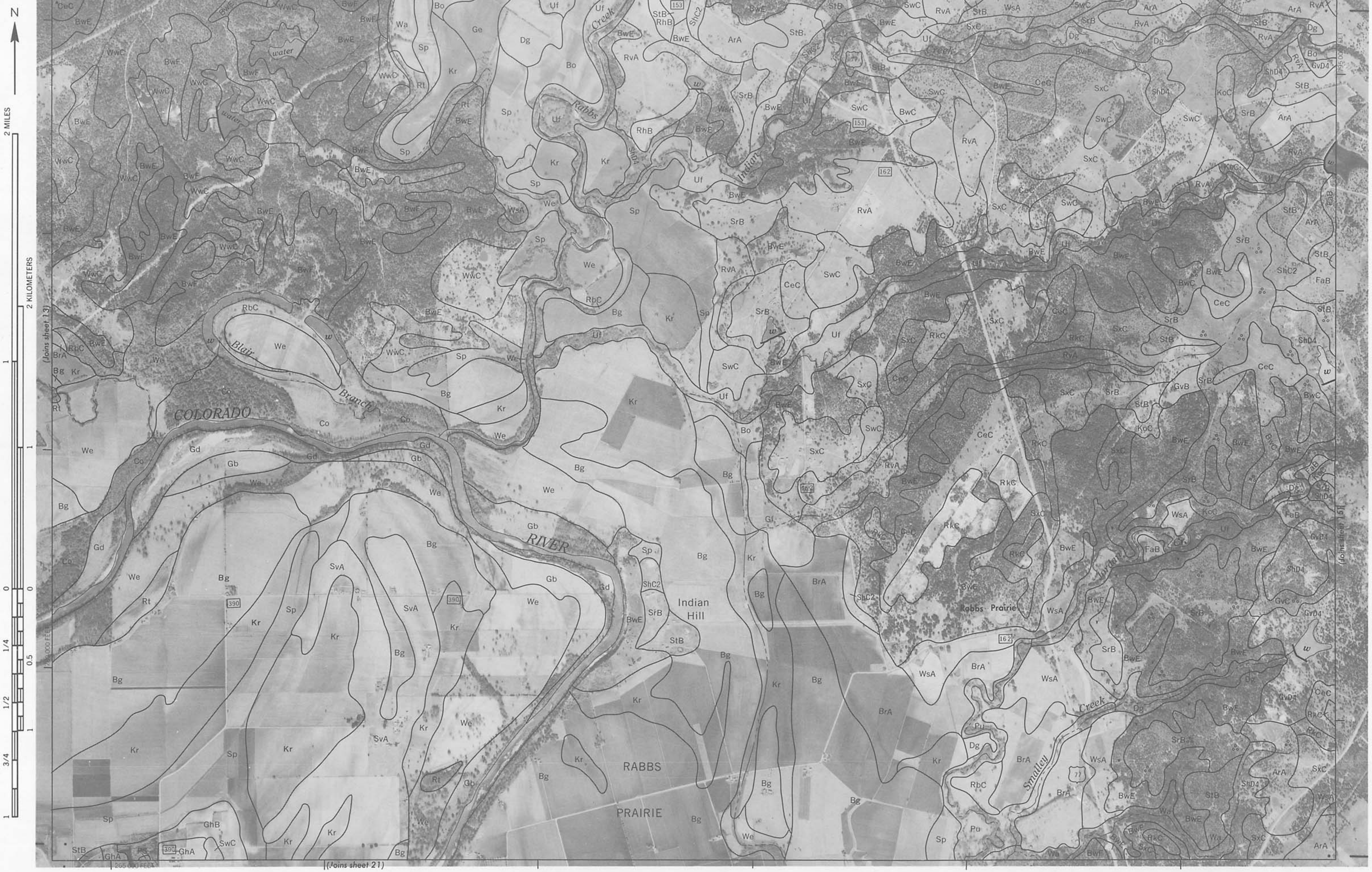

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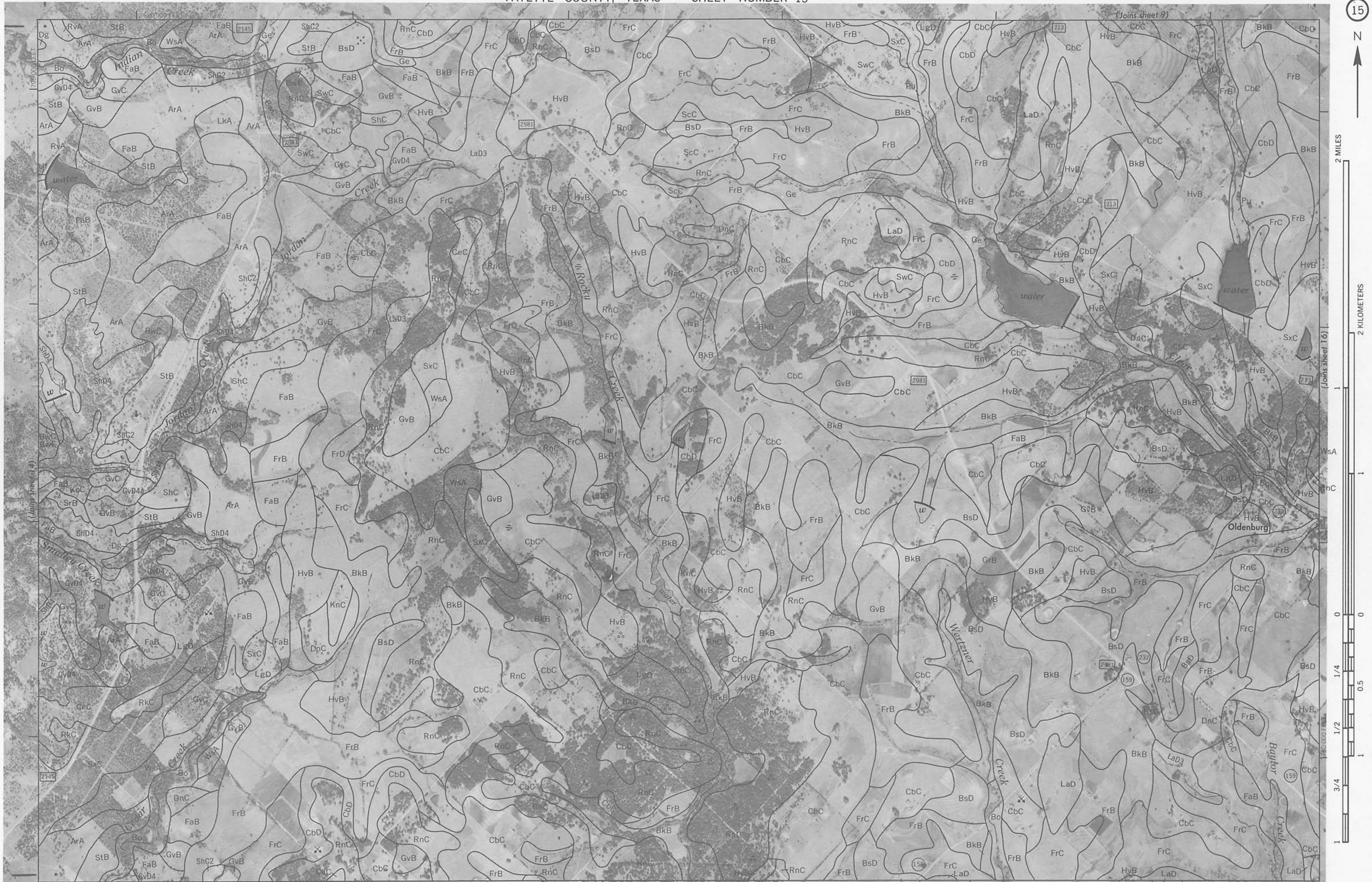

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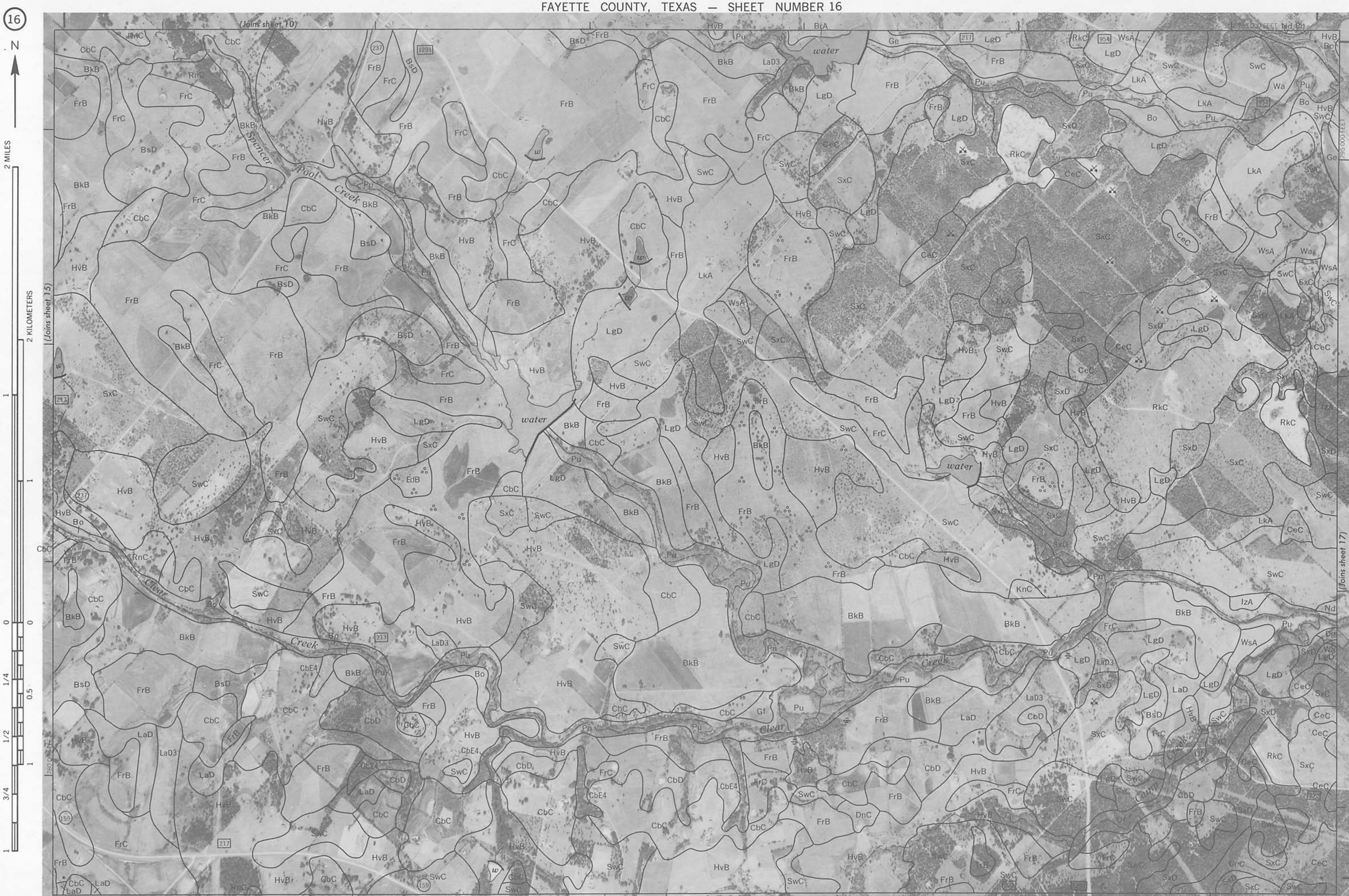

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FAYETTE COUNTY, TEXAS — SHEET NUMBER 18

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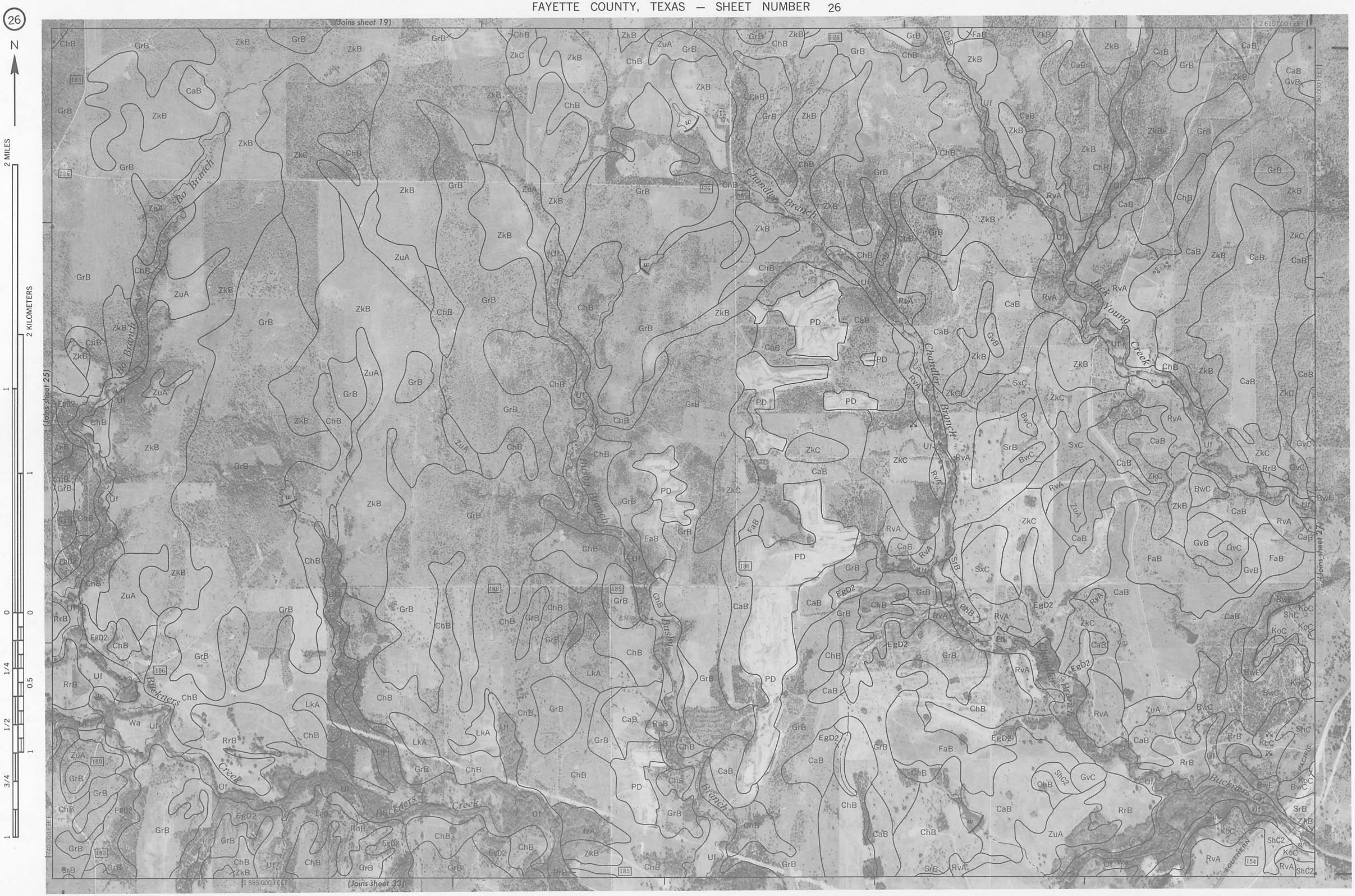

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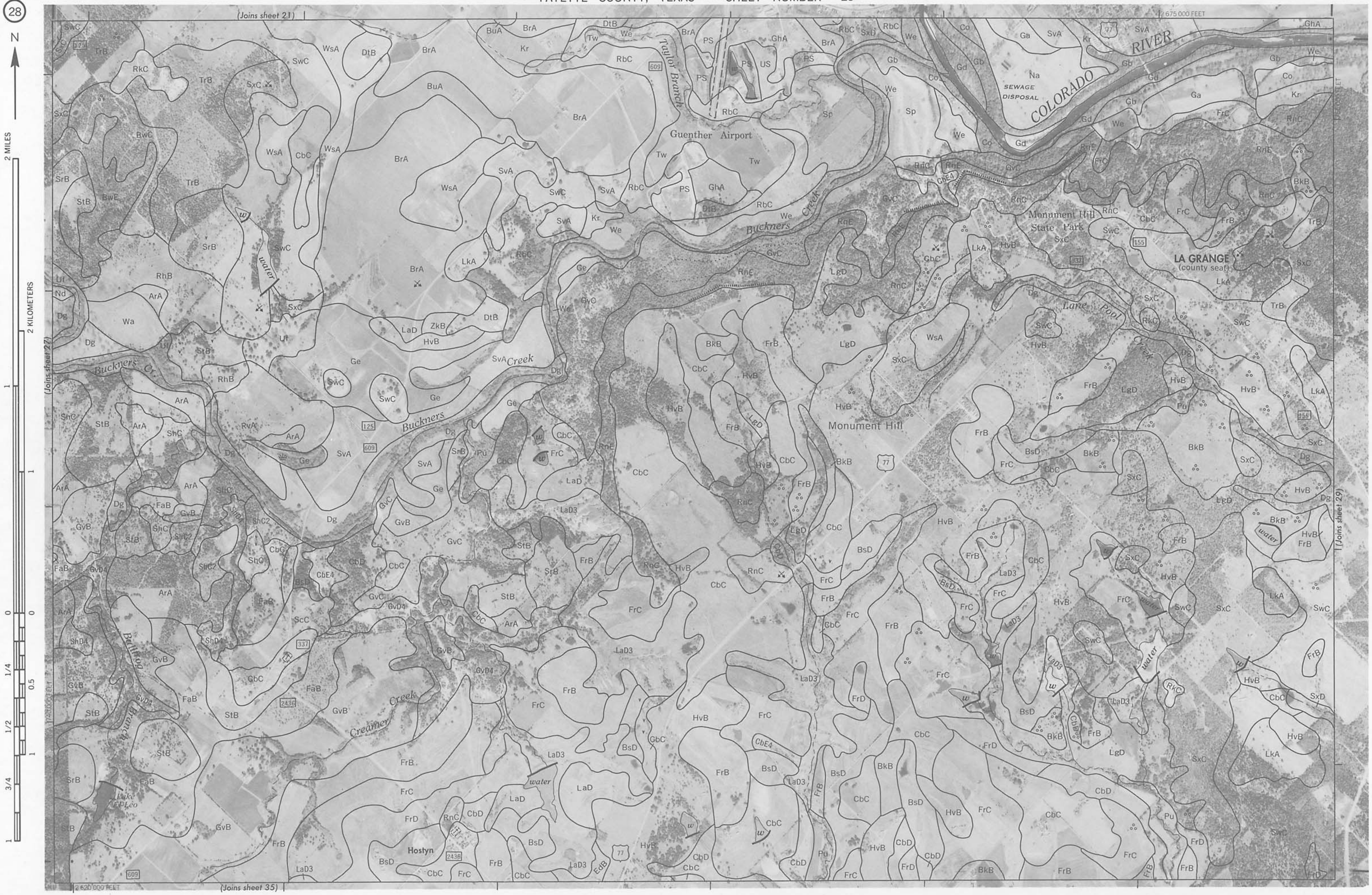

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N

2 MILES

2 KILOMETERS

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

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